DOCUMENT RESUME

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ABSTRACT

The set of 10 units is designed for use with an instructor as an introduction to technical drafting, and is also keyed to other texts. Each unit contains several task packages specifying prerequisites, rationale for learning, objectives, learning activities to be supervised by the instructor, and learning practice. The units cover: drafting instruments, technical lettering, applied geometric construction, draftsman's alphabet of lines, orthographic projection, dimensions and notes, sections, auxiliary views, architectural drafting, and map drafting. (BP)

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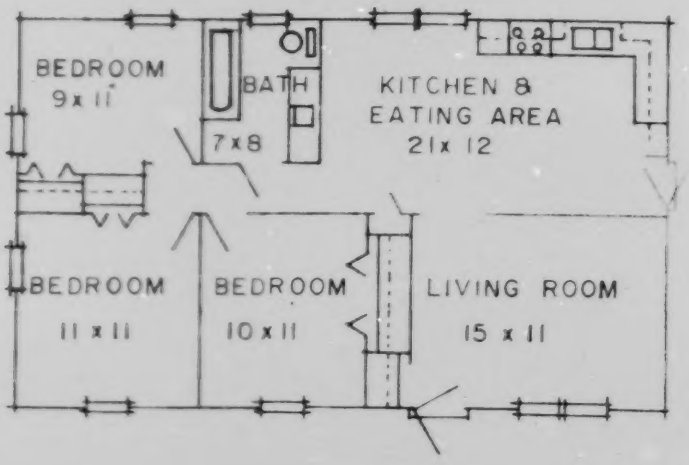

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CE003935(a)

CLUSTER: DRAFTING

COURSE: INTRODUCTION TO TECHNICAL DRAFTING

draw circles and arcs; the protractor, an item that makes angular

3

ANTICIPATORY SET (cont'd):

[illegible] your name on it now." But you were not alone -- teachers have [illegible] this way before."

[illegible] to look over the [illegible] first task package, [illegible] to put yourself started on a marvelous [illegible], on journey of boundless pleasure."

OBJECTIVES:

General:

Upon completion of this unit package you will be able to master the basic skills and use of the basic instruments in drafting by completing the following:

Specific:

Upon completion of the task packages for this unit, you will be able to:

1. Measure, read and record to the smallest unit, lines of various lengths, using all the scales on the following triangular scales:
   a. architect's scale.
   b. mechanical engineer's scale.
   c. civil engineer's scale.
2. Accurately construct, using appropriate drawing and mechanical pencils, straight and even, vertical, horizontal, angular and

OBJECTIVE 3 (cont'd):

parallel lines, using the [illegible] and the 45° and 30° - 60° triangles. Your performance will be evaluated in accordance with the [illegible] task.

[illegible] the following operations:

a. [illegible] a circle and an arc with smooth, even lines.

b. measure an [illegible] protractor within 5° of accuracy.

c. draw curves with the irregular curve smoothly with no break in the line flow.

Your performance will be evaluated in accordance with the instructor's checklist.

LEARNING ACTIVITY:

In order to complete this unit successfully you should begin your work on Task Package 1, and then as a suggestion proceed to complete each task package in order until you have finished each package in this unit. In the packages you will be asked to view a sound-slide presentation, read and answer questions, and perform some practical exercises. The number and names of the task packages included in this unit are as follows:

ARGING ACTIVITY (cont'd):

PAGE PACKAGE 1: [illegible]

TASK PACKAGE 2: CARDS AND SETS OF TWO SQUARES

AND 3 SQUARES

PAGE PACKAGE 2: CARDS, ACTIVITY, AND GRAPHS

IF YOU [illegible] to give a comprehensive test at this time, contact your instructor. However, should you feel you are ready to be tested, begin your work as outlined above.

DC-1-1

UNIT 1: DRAFTING INSTRUMENTS

TASK PACKAGE 1: DRAFTING SCALES

PREREQUISITES: NONE

RATIONALE:

Measurement is a technique that was used by the Egyptians over 5000 years ago. The Egyptians built their pyramids with extremely accurate measuring devices. One of the reasons the pyramids are still standing today is because of the Egyptians' insistence upon a standard, which was the "cubit."

Draftsmen have to be accurate in their measurements so that they can communicate their design specifications to machinists, surveyors, and builders. Measuring accurately is a primary task of a draftsman. To be proficient as a draftsman, you must be able to use the architect's, civil engineer's and mechanical engineer's scales accurately and properly in the measurement of lines. In this package you will learn the procedures and accepted practices for using these scales.

DC-I-1

OBJECTIVE:

Upon completion of this task package you will be able to measure, read and record to the smallest unit, lines of various lengths, using all the scales on the following triangular scales:

1. Architect's scale
2. Mechanical engineer's scale
3. Civil engineer's scale

LEARNING ACTIVITY:

1. Read paragraphs 37-39, pages 27-30 - Basic Technical Drawing, Spencer.
2. Review sound-slide presentation DC-I-1, and filmstrip FS665618.
3. Being able to use the scale effectively will require a good knowledge of fractions. If you do not possess this knowledge, check with your instructor.
4. After having read your reference material and reviewed the filmstrip and slides, can you name the three scales used by a draftsman? Name them. 1._____ 2._____ 3._____.
5. Can you explain the difference between the three scales? Explain the difference. _____

_____

LEARNING ACTIVITY (cont'd):

6. What would a line of 3" equal if scaled with the 1/8" = 1'-1" on the architect's scale?_____

7. Which scale is used to measure house plans?_____

8. Write a brief description of the 1/2 scale on the mechanical engineer's scale.

9. Into what parts is the civil engineer's scale divided?

10. Now that you have command of the Learning Activity, check with your instructor and give him your answers.

LEARNING PRACTICE:

1. Measure the following lines, using all the scales on the architect's scale. Record your answer to the smallest increment of each scale on this sheet.

A. a._____ b.

1/4" = 1'-0" ____	3/8" = 1'-0" ____	1" = 1'-0" ____
1/8" = 1'-0" ____	3/4" = 1'-0" ____	1/2" = 1'-0" ____
3/32" = 1'-0" ____	3" = 1'-0" ____	12" = 1'-0" ____
3/16" = 1'-0" ____	1 1/2" = 1'-0" ____	

B. c._____ _____d.

1/4" = 1'-0"	3/8" = 1'-0" ____	1" = 1'-0" ____
1/8" = 1'-0" ____	3/4" = 1'-0" ____	1/2" = 1'-0" ____
3/32" = 1'-0" ____	3" = 1'-0" ____	12" = 1'-0" ____
3/16" = 1'-0" ____	1 1/2" = 1'-0" ____	

LEARNING PRACTICE (cont'd):

1. e. _____

1/4" = 1' - 0" ____ 3/8" = 1' - 0" ____ 1" = 1' - 0" ____

1/8" = 1' - 0' ____ 3/4" = 1' - 0" ____ 1/2" = 1' - 0" ____

3/32" = 1' - 0" ____ 3" = 1' - 0" ____ 12" = 1' - 0" ____

3/16" = 1' - 0" ____ 1 1/2" = 1' - 0" ____

2. Measure the following lines, using all the scales on the civil engineer's scale. Record your answer to the smallest increment of each scale on this sheet.

A. a. _____ b.

1" = 10' _____ 1" = 40' _____

1" = 20' _____ 1" = 50' _____

1" = 30' _____ 1" = 60' _____

B. a. _____ b.

1" = 10' _____ 1" = 40' _____

1" = 20' _____ 1" = 50' _____

1" = 30' _____ 1" = 60' _____

C. a. _____ b.

1" = 10' _____ 1" = 40' _____

1" = 20' _____ 1" = 50' _____

1" = 30' _____ 1" = 60' _____

3. Measure the following lines, using all the scales on the mechanical engineer's scale. Record your answer to the

LEARNING PRACTICE (cont'd):

smallest increment on each scale on this sheet.

A. a. b.

1/4 size _____ /8 size _____

1/2 size _____ 3/4 size _____

B. a. b.

1/4 size _____ 3/8 size _____

1/2 size _____ 3/4 size _____

5. Hey!! Congratulations - It's "Show and Tell Time." Show the instructor your work and he will tell you how successful you have been.

DC-I-2

UNIT I: DRAFTING INSTRUMENTS

TASK PACKAGE #2: CARE AND USE OF "T" SQUARE AND TRIANGLES

PREREQUISITES: NONE

RATIONALE:

Congratulations for having developed the skill of being able to utilize the scales used in the field of drafting. In this task package, you will come into contact with some of the other pieces of equipment used by the draftsman. The "T" square and triangles produce the straight lines of drafting. The combination of the 30°-60° and 45° triangles creates other lines necessary for a draftsman to do his job.

This package will also introduce you to the type of leads and pencils used in the drafting industry. Through a combination of pencil, hand, equipment and this task package you can come one step closer to your final goal -- a skilled draftsman.

As you proceed through the Learning Practice and Activity, do not hesitate to glance back occasionally at the Objective. In drafting, you will want to do your creative work to a "T".

OBJECTIVE:

Upon completion of this task package you will be able to accurately construct, using appropriate drawing and mechanical pencils, straight and even, vertical, horizontal, angular and parallel lines, using the "T" square, 45°, and 30°-60° triangle. Your performance will be evaluated in accordance with the instructor's checklist.

LEARNING ACTIVITY:

1. Read pages 14-25 of Basic Technical Drawing.
2. Review sound-slide presentation DC-I-2.
3. In drawing a vertical line using one triangle, the triangle should be on which side on the line? _____
4. By using a 45° triangle, a circle may be divided into how many parts? _____
5. By using a 30°-60° triangle, a circle may be divided into how many parts? _____
6. If both triangles are used in combination, a circle may be divided into how many equal parts? _____
7. Review pages 21 and 22 in your textbook.
8. Why do you rotate the pencil when you draw a line? _____

_____

LEARNING ACTIVITY (cont'd):

9. All horizontal lines are drawn using only what part of the "T" square? _____

10. What are the three grades of pencil leads that are used in drafting? 1. _____ 2. _____ 3. _____

Now, if you want to, make this a learning practice, or make it your thing -- right!!!

Then take your layout to the instructor and have him check them.

LEARNING PRACTICE:

Read, carefully, completely through the Learning Practice before starting to work. Using layout "A", inside the back cover of your textbook, prepare a sheet of paper. Divide the paper horizontally. Items 1 and 2 will be constructed in the top half of your sheet; item 3 will be constructed in the lower half of the paper.

Happiness is doing a Learning Practice. Don't be uptight -- do it right.

1. On the prepared sheet of paper, draw and label each of the following angles using the two triangles and the "T" square.

NOTE: Make all lines 1 1/2" long and use the same common vertex*

45°, 90°, 30°, 60°, 315°, 300°, 330°, and 120°.

*(A vertex is a point where two or more lines meet. Example: the center of a circle that has been divided into four parts.)

LEARNING PRACTICE (cont'd):

2. On the prepared sheet of paper used for the previous practice, draw a 3" diameter circle with a compass, and divide the circle into eight equal parts, using the 45° triangle.

3. On the prepared sheet of paper used above, draw a 3" diameter circle with a compass and divide it into 24 equal parts, using a combination of triangles.

4. On a separate sheet of paper, draw the base plate, Figure 74 shown on page 40 in your textbook. Follow the directions listed in Figure 75, page 40.

5. Finishing a task package is the real thing. Take your Learning Practice to the instructor for evaluation.

DC-I-3

UNIT I: DRAFTING INSTRUMENTS

TASK PACKAGE 3: DRAWING ARC, LINES, ANGLES AND CURVES

PREREQUISITES: NONE

RATIONALE:

In this task package of Unit I, you will cover the last steps in basic drafting skills. You will become familiar with the bow compass, the protractor, and an object called the "French curve," sometimes referred to as the "irregular curve."

Straight lines are not the only lines encountered by a draftsman in his daily work. He will be concerned with curves, arcs and circles. These different lines are constructed with the above named items. You must cultivate the skills to draw these different types of lines and to match curves with straight lines to develop continuity of line.

The protractor, a device used to measure angles, should be familiar to you. It is an important piece of equipment to a draftsman.

Now, after reading the behavioral objective carefully, see if you can master the curves well.

OBJECTIVE:

Upon completion of this task package you will be able to correctly perform the following operation:

1. Scribe with a compass a circle and an arc with smooth, even lines.
2. Measure angles with a protractor within 1° of accuracy.
3. Draw curves with the irregular curve smoothly, with no break in the line flow.

Your performance will be evaluated in accordance with the instructor's check list.

LEARNING ACTIVITY:

1. Read Paragraphs 41-46, pp. 30-35 of Basic Technical Drawing.
2. Review sound-slide presentation DC-I-3 and Filmstrip FS665619.
3. In placing the irregular curve, the ruling edge must pass through how many points? State in writing your answer to this and all subsequent questions in the Learning Activity.
4. Read item 44, page 33 in your textbook.
5. What does the protractor measure?
6. What is the most sensitive piece of drawing equipment?
7. If you were to draw a circle 3" in diameter with a compass, what would be the distance you would set on your compass?

LEARNING ACTIVITY (cont'd):

3. Can you believe it!!! You've finished another Learning Activity. Take your completed list to the instructor so it can be checked.

LEARNING PRACTICE:

DIRECTIONS:

Read, carefully, through the Learning Practice completely, before starting to work.

Draw each object on a separate sheet of paper. Use sheet layout "A" for each drawing.

1. Draw the slotted cam, figure 82, on page 42 in Basic Technical Drawing. Center the drawing on your paper.
2. Draw table leaf support wing, figure 87 on page 42 in Basic Technical Drawing.
3. Finishing a task package is the real thing - at least that's what they say. Since you've finished yours take it to the instructor for evaluation.

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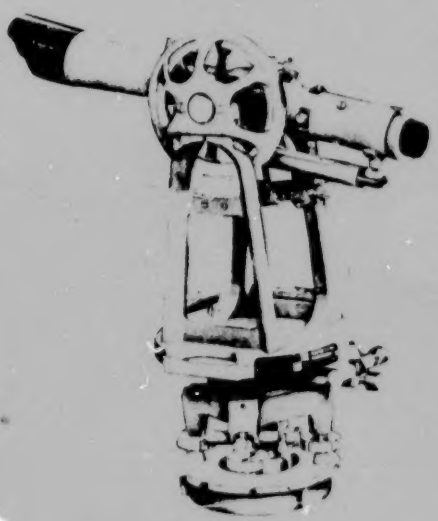

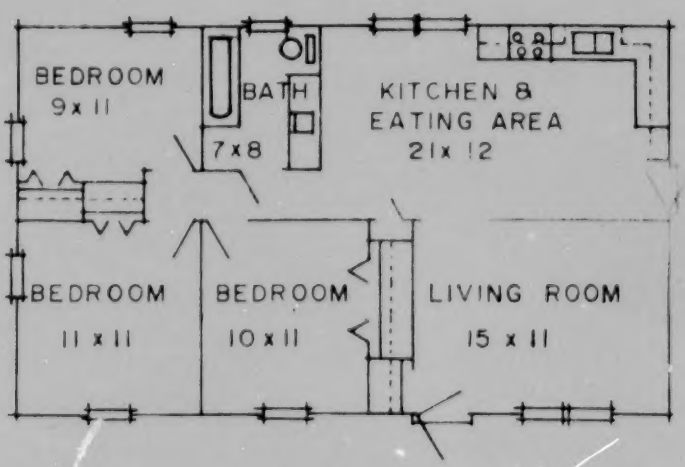

CLUSTER: DRAFTING
COURSE: INTRODUCTION TO TECHNICAL DRAFTING

CE003935 (6)

DC-II

UNIT PACKAGE 11: TECHNICAL LETTERING

PREREQUISITES: UNIT II

RATIONALE:

Drawing is a graphical language. To help further explain the representations a draftsman constructs, he uses notes. These notes must be lettered so that the reader can easily interpret the draftsman's message.

The draftsman needs to communicate without any trouble. His letters should be neat, well-formed and spaced for easy interpretation. This unit will help you attain your goals and the objectives listed in the task package.

OBJECTIVES:

GENERAL:

Upon completion of this unit package you will be to letter correctly using the various techniques employed by the draftsman.

SPECIFIC:

Upon completion of the task packages for this unit, you will be able to letter correctly the vertical and inclined techniques. You will be evaluated on proper spacing and the formation of the letters.

LEARNING ACTIVITY:

This unit has one task package. In this package you will be asked to view a sound-slide presentation, read and answer questions, and perform some practical exercises. The number and name of the task package included in this unit are as follows:

TASK PACKAGE 1: LETTERS USING VERTICAL AND INCLINED TECHNIQUES

If you should feel confident enough to pass a comprehensive test at this time, contact your instructor. However, should you feel you are not ready to be tested, begin your work as outlined above.

DC-II-1

UNIT II: TECHNICAL LETTERING

TASK PACKAGE I: LETTERS USING VERTICAL AND INCLINED TECHNIQUES

PREREQUISITE: UNIT I

RATIONALE:

Lettering is an old art. It has been practiced for thousands of years. Many civilizations have left records of their history through their written language. Some used symbols representing objects and others used a type of alphabet. But if these symbols had not been legibly portrayed, no one could have interpreted the language.

A draftsman needs to know how to use his equipment properly, but he also needs to know how to letter neatly and legibly. The lines, circles and arcs blend together to form a graphic language; but the written language in the form of notes and numbers helps to further explain this graphic language.

There are several different techniques of lettering but the draftsman relies on only two basic styles: the vertical and inclined methods. Through practice and concentration you can develop the ability to letter neatly and legibly.

OBJECTIVE:

Upon completion of this task package you will be able to letter correctly using the vertical and inclined techniques. You will be evaluated on proper spacing and the formation of the letters.

LEARNING ACTIVITY:

1. Read pages 43-56 in Basic Technical Drawing.
2. Review sound-slide presentation DC-II-I and Filmstrip FS665620.
3. What is one of the main requirements of good lettering?

   (Write answers to these questions in the spaces provided.)

   _____

4. What are four items you should know, to developing lettering technique? _____

   _____

5. What are two types of letters? _____

   _____

6. Name one mechanical device used in lettering. _____

   _____

7. Look at Figure 105, page 50 in your textbook. Which is larger, the fraction or the whole number? _____

   _____

LEARNING ACTIVITY (cont'd):

8. Explain how you space between l[illegible]ers._____

_____

9. Of course you realize you finished another Learning Activity. Congratulations! Now, let your instructor check your answers.

LEARNING PRACTICE:

1. Complete the following exercises in this packags by using the proper lettering technique.
2. Complete the exercise (Fig. 125) on page 57 in your textbook. Follow instructions given on page 56.
3. You know "Happiness is doing a Learning Practic."
4. Complete the exercise (Fig.126) on page 57 in your textbook. Follow instructions given on page 56.
5. Complete the exercise (Fig. 127) on page 57 in your textbook. Follow instructions given on page 56.
6. Ain't nothin' like a real task package!!
7. Complete the exercise (Fig. 128) on page 57 in your textbook. Follow instructions given on page 56.
8. Complete the exercise (Fig. 129) on page 58 in your textbook. Follow instructions given on page 56.
9. Complete the exercise (Fig. 130) on page 58 in your textbook. Follow instrutions given on page 56.

LEARNING PRACTICE (cont'd):

10. Complete the exercise (Fig. 131) on page 58 in your textbook. Follow instructions given on page 56.
11. Whoa!!! The end is in sight.
12. Complete the exercise (Fig. 132) on page 58 in your textbook. Follow instructions given on page 56.
13. Remember that the written language used in drafting is always in the form of LETTERING (not handwriting). Simple freehand lettering, perfectly legible and quickly made, is an important part of a drawing. Therefore, from this point on, LETTERING will be considered a vital factor in your grade.

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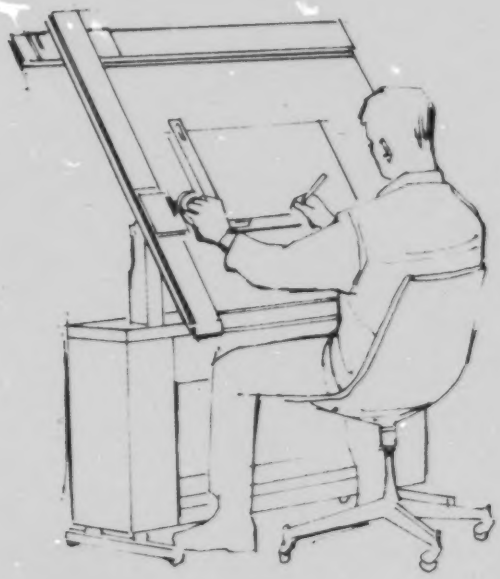

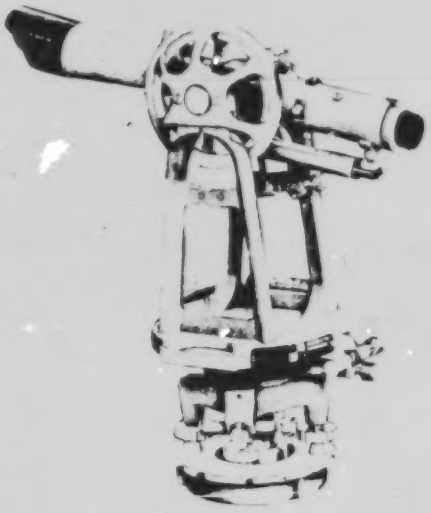

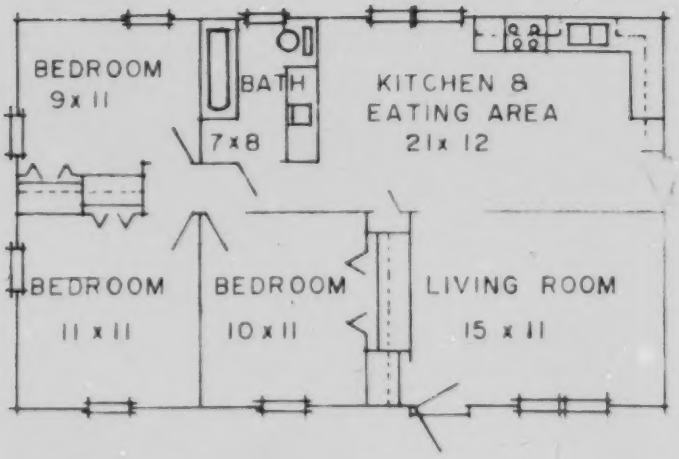

CE003935-(e)

CLUSTER: DRAFTING

COURSE: INTRODUCTION TO TECHNICAL DRAFTING

DC-III

UNIT PACKAGE 5: APPLIED GEOMETRIC CONSTRUCTION

PREREQUISITES: UNIT 1

RATIONALE:

The draftsman needs to know the different types of geometric figures and constructions. The objects that the draftsman will create will be composed of these elements. The various angles, the bisection of lines, the different polygons all need to be part of the draftsman's drawing vocabulary.

The geometric figures should be drawn so that they communicate the ideas of the draftsman. The lines should flow so as to show continuity. The desire to learn and the fulfillment of the objectives in this unit should lead you to a new skill.

OBJECTIVES:

GENERAL:

Upon completion of this unit package you will be able to construct geometric figures; draw arcs tangents to lines and other arcs, and bisect lines and angles, using the basic drafting equipment.

SPECIFIC:

Upon completion of the task packages for this unit, you will be able to:

OBJECTIVE (cont'd):

1. Accurately bisect lines and angles, and construct a circle through three points, using the "T" square, triangles and bow compass. Your performance will be evaluated on the basis of the straightness of the line, the correctness of the operation, and in accordance with the instructor's checklist.
2. Draw regular polygons, using the "T" square, triangles and compass instruments. Your performance will be judged based on the neatness of your construction of the correct number of sides for the polygon, and the equality of the angles in size.
3. Accurately draw arcs tangent to arcs, lines and circles, using common drafting equipment. Your performance will be evaluated on the basis of the line flow, smoothness of construction, and the correctness of procedure, as determined by the instructor's checklist.

LEARNING ACTIVITY:

In order to complete this unit successfully, you should begin your work on task package 1, and then as a suggestion, proceed to complete each task package in order, until you have finished each package in this unit. In the packages, you will be asked to view a sound-slide presentation, read and answer questions, and perform some practical exercises. The number and names of the task packages included in this unit are as follows:

LEARNING ACTIVITY (cont'd):

TASK PACKAGE 1: BISECTION OF LINES AND ANGLES AND CONSTRUCTION OF FIGURES

TASK PACKAGE 2: DRAWING REGULAR POLYGONS

TASK PACKAGE 3: DRAWING ARCS TANGENT TO ARCS, LINES AND CIRCLES

If you should feel confident enough to pass a comprehensive test at this time, contact your instructor. However, should you feel you are not ready to be tested, begin your work as outlined above.

DC-III-1

UNIT III: APPLIED GEOMETRY TO TECHNICAL DRAFTING

TASK PACKAGE #1: BISECTION OF LINES AND ANGLES AND CONSTRUCTION OF FIGURES

PREREQUISITES: UNIT I

RATIONALE:

Most of the views required in mechanical drawings can be made by using the drawing instruments previously introduced, without special consideration to procedure. However, it is sometimes necessary and certainly more convenient to use geometric construction.

The bisection of lines and angles and the construction of figures are methods that make an idea come to life on a piece of paper. The draftsman must be proficient in his ability to perform geometric construction.

There are different angles, polygons, and geometric figures that a draftsman has to be familiar with. In this package and the two that follow you will be given the opportunity to use the different means of bisection and figure construction. So get on - with a polygon!

OBJECTIVE:

Upon completion of this task package you will be able to accurately bisect lines and angles, and construct a circle through three points, using the "T" square, triangles and bow compass. Your performance will be evaluated on the basis of the straightness of the lines, the correctness of the operations, and in accordance with the instructor's checklist.

LEARNING ACTIVITY:

1. Read pages 59-67 in Basic Technical Drawing.
2. Review sound-slide presentation DC-III-1.
3. What does the symbol ℄ mean? (Write your answer to this and other questions in the spaces provided.)
4. What does the symbol ⊥ mean?
5. The sum of a triangle's interior angles is equal to what?
6. Look at Figure 133 on page 60 in your textbook. Explain the difference between eccentric and concentric.

LEARNING ACTIVITY (cont'd):

7. How many degrees are there in an acute angle?_____

8. How many degrees are there in an obtuse angle?_____

9. Explain the term "complimentary angles." _____

_____

10. Explain the term "supplementary angles." _____

_____

11. Could this be magic!!! Another Learning Activity completed! Take your answers to your instructor so that he may check them.

LEARNING PRACTICE:

DIRECTIONS: Read carefully through the entire Learning Practice before starting to work. Prepare a sheet of drawing paper, using sheet layout "A".

1. Divide the paper into four equal parts, as shown in Figure 156 on page 67. In the upper left-hand corner construct a perpendicular bisector. Given line A-B 3 1/4" long, using the perpendicular bisector method, bisect line A-B (Figure 138, Page 62).

2. In the upper right-hand corner of the paper bisect an angle. Given an angle of 75°, bisect the angle using your compass.

3. In the lower left-hand corner of the paper construct a triangle. Given the following information, construct a triangle: Line A = 3", B = 2" and C = 4". Use your compass to measure the lines.

LEARNING PRACTICE (cont'd):

4. In the lower right-hand corner of the paper, construct a circle through three points. At this point, check with your instructor and he will place the three points through which to draw the circle. Use your compass and triangles for this operation.
5. Prepare another sheet of paper using layout "A". Draw Figure 77, page 40 in your text. Draw the object full size, centering it on your paper.
6. When you complete the Learning Practice take all practice items to the instructor for evaluation. You've come a long way, baby!

DC-III-2

UNIT III: APPLIED GEOMETRY IN TECHNICAL DRAFTING

TASK PACKAGE #2: DRAWING REGULAR POLYGONS

PREREQUISITES: UNIT I

RATIONALE:

Do you know what shape a bolt head has? What about a stop sign? In this task package you will draw the geometric shapes called "regular polygons." A draftsman needs to know how to construct these shapes because he comes into contact with them frequently. The hex head bolt, the square head bolt and other regular polygon forms are often used in the language of the draftsman.

You will use different methods of constructing these forms. The compass and the triangle are the basic tools that will help lead you to create these geometric forms of drafting. Learning to use them properly now will pay off for you in the future.

OBJECTIVE:

Upon completion of this task package you will be able to correctly draw regular polygons using the "T" square, triangles and compass. Your performance will be judged, based upon the neatness of your constructions, the correct number of sides for the polygons, and the equality of the angles in size.

LEARNING ACTIVITY:

1. Review pages 59-67 in Basic Technical Drafting.
2. Review the sound-slide presentation DC-III-2.
3. What is an equilateral triangle? (Write your answer to this and the other questions in the spaces provided.) _____

_____

_____

4. Study page 60, items 16 through 28 in your textbook.
5. How many sides does a hexagon have? _____
6. Look at the figure 145 on page 63 in your textbook. What are the three methods for constructing an octagon? _____

_____

_____

7. Take your answers to the instructor so they can be checked.

LEARNING PRACTICE:

DIRECTIONS: Read carefully through the Learning Practice, completely, before starting to work. Obtain a sheet of drafting paper and prepare it, using layout "A".

1. Constructing a square within a circle (also termed inscribing a square within a circle).
   a. Prepare your paper using layout "A".
   b. Divide the paper into 4 equal parts in accordance with Figure 156 on page 67.
   c. In the upper right-hand corner of the paper construct a circle 3" in diameter.
   d. Inscribe a square within the circle (See Figure 145, page 63).
2. Constructing a hexagon.
   a. In the upper left-hand corner of the paper construct a circle 3" in diameter.
   b. The diameter of the circle equals the distance across the corner of a hexagon. (Two new phrases - Across the corner - the distance from one corner diagonally to the opposite corner. Across the flats - the distance from one side perpendicular to the opposite side).
   c. Using the 3" circle as the distance across the corner, construct a hexagon within the circle. (See Figure 145, page 63.)

LEARNING PRACTICE (cont'd):

3. Constructing an octagon.

   a. In the lower left-hand corner of your paper, draw a square with 2" sides.

   b. Using your compass, "T" square, and triangles, construct an octagon within the square (See Figure 145, page 63.)

4. Constructing a shim.

   a. Lay out your paper using layout "A".

   b. Turn in your book to page 40, Figure 76. Draw the shim full size, centering it on your paper.

5. That's the way to hack it!! Turn in all your drawings to the instructor for evaluation.

DC-III-3

UNIT III: APPLIED GEOMETRIC CONSTRUCTIONS

TASK PACKAGE 3: DRAWING ARCS TANGENT TO ARCS, LINES AND CIRCLES.

PREREQUISITES: UNIT 1

RATIONALE:

The final step in creating these additional lines in geometric construction is the development of skill in drawing tangent arcs. Arcs that are tangent to lines, or to other arcs, help develop the even, steady flow of lines necessary in drafting work.

This package will help reinforce your skill in the use of the compass. You will be able to develop arcs tangent to acute, obtuse and right angles. With your new skill gained from completion of this package you will be able to construct arcs that are tangent to other arcs. You should familiarize yourself with these basic geometric constructions and learn their uses in order to complete the assigned drawings.

Did you know that the geometry of snow is unique? No two snowflakes are exactly the same in geometric pattern.

OBJECTIVE:

Upon completion of this task package you will be able to accurately draw arcs tangent to arcs, lines and circles, using common drafting equipment. Your performance will be evaluated on the basis of the line flow or smoothness of construction and the correctness of procedure, as determined by the instructor's check list.

LEARNING ACTIVITY:

1. Review pages 59-67 in Basic Technical Drawing.
2. Review sound-slide presentation DC-III-3.
3. Look at figure 150 on page 64 in your textbook. What type of angle is used in part "a"? Write your answer. _____
4. Look at figure 150 on page 64 in your textbook. What type of angle is used in part "b"? Write your answer. _____
5. Look at figure 150 on page 64 in your textbook. What type of angle is used in part "c"? Write your answer _____
6. Look at figure 149 on page 64 in your textbook. With "c" as the center of the circle and line CT intersecting the point of tangency on the circle, what is the angle formed with the

LEARNING ACTIVITY (cont'd):

tangent line and line CT? Write your answer._____

_____

7. You've come a long way, baby. Now take your answers to the instructor, so that he may check them.

LEARNING PRACTICE:

DIRECTIONS: Read carefully through the Learning Practice completely before starting to work. Obtain three sheets of drawing paper. Use the layout specified for each exercise below.

1. Draw an arc tangent to two straight lines that form an acute angle.
   a. Prepare your paper using layout "A".
   b. Divide your paper into four equal parts in accordance with Figure 156 on page 67.
   c. In the upper left-hand corner of your paper, using your drafting equipment and protractor, construct in the center of the block an angle of 85° with the sides 1 1/2" in length.
   d. Given a radius of 3/4", construct an arc tangent to the above angle. Follow the instruction on page 64, figure 150 (a).
2. Draw an arc tangent to two straight lines that form an obtuse angle.
   a. In the upper right-hand corner of your paper draw in the center of the block an angle of 145° with sides that are 2" in length.

LEARNING PRACTICE (cont'd):

b. Given a radius of 3/4", construct an arc tangent to the above angle. Follow the instructions on page 64, Figure 150 (a).

3. Draw an arc tangeht to two straight lines that form a 90° angle.

a. In the lower left-hand corner of your paper, draw in the center of the block a 90° angle with arms 2" in length.

b. Given a radius of 3/4", construct an arc tangent to the above angle. Follow the instructions on page 64, figure 150 (c).

4. Draw an arc tangent to a straight line and arc (obtuse).

a. In the lower right-hand corner of your paper draw in the center of the block a given arc of 2" in radius and swings approximately 90°. Given a horizontal straight line of 2", draw a line that intersects the arc.

b. Given a radius of 3/4", construct an arc tangent to the given arc and line. Follow the instructions on page 65, figure 151 (a).

5. Draw an arc tangent to an arc and line (acute).

a. Prepare your paper using layout "A".

b. Divide the paper into four equal parts in accordance with Figure 156 on page 67.

LEARNING PRACTICE (cont'd):

c. In the upper left-hand block construct an arc with a 3" radius and swing the arc to the left through approximately 90°.

d. From the center point you used to scribe the arc, draw a line to the left intersecting the arc.

e. Given a radius of 3/4", construct an arc tangent to the given arc and line. Follow the instructions on page 65, Figure 151 (b).

6. Draw an arc tangent to two arcs.

a. Look at the illustration on page 65, Figure 151 (c).

b. Given an arc of 2" diameter, on the same center line 4" away construct an arc of 1" diameter.

c. Given a radius of 2", construct an arc tangent to the given arcs.

* If you have difficulty see your instructor.

7. Draw the gasket on page 69, Figure 162.

a. Prepare your paper using layout "C".

b. Don't forget to center the gasket on your paper.

c. Using the dimensions given in Figure 162 on page 69, draw the gasket full scale.

8. How many of your friends can do this? Give your work to the instructor for evaluation.

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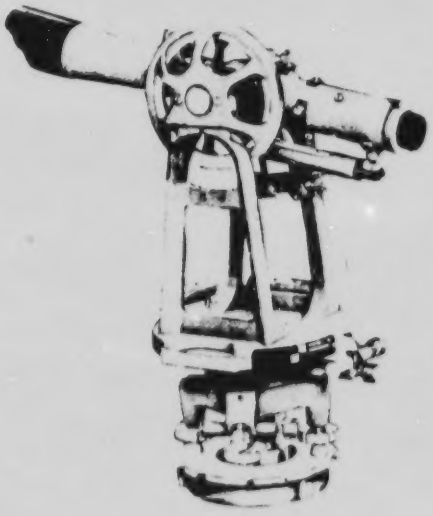
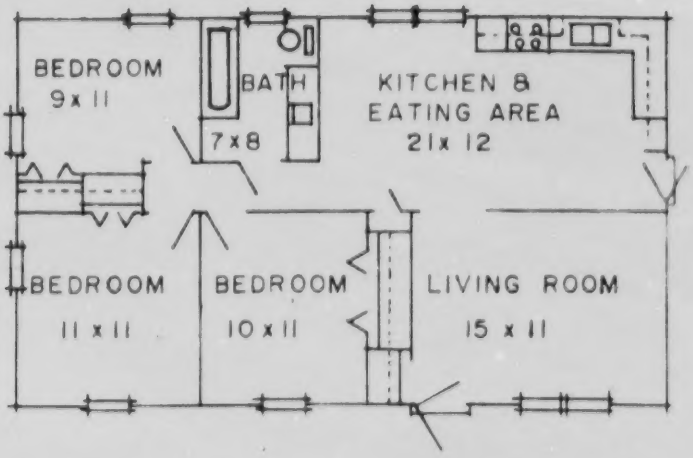




CEO 03935 (cd)

CLUSTER: DRAFTING

COURSE: INTRODUCTION TO TECHNICAL DRAFTING

DC-IV

UNIT PACKAGE: DRAFTSMAN'S ALPHABET OF LINES

PREREQUISITES: UNITS I - III

RATIONALE:

The draftsman uses his drawings as a technique of communication. His ideas are graphically represented. The lines the draftsman draws have meanings. The lines represent something. This unit will help you become familiar with the alphabet of lines. You will see how each line is used to express its meaning. Some of the names of the lines become evident when you see them in use. In order not to misrepresent his ideas the draftsman must become aware of how the alphabet of lines is to be used. You should succeed through the implementation of the Objective.

OBJECTIVE:

GENERAL:

Upon completion of this unit package you will be able to demonstrate the uses of the draftsman's alphabet of lines by identifying the lines in use.

SPECIFIC:

Upon completion of the task packages for this unit, you will be able to:

1. accurately list, from a series of illustrations, the following draftsman's alphabet of lines.

OBJECTIVES (cont'd):

a. object or visible line.

b. construction lines.

c. hidden line.

d. section line.

e. center line.

f. extension and dimension line.

g. cutting plane line.

h. short and long break lines.

i. phantom line.

Your performance will be evaluated on a written test involving the naming of lines from illustrations.

LEARNING ACTIVITY:

This unit has one task package. In the package you will be asked to view a sound-slide presentation, read and answer questions, and perform some practical exercises. The number and name of the task package included in this unit are as follows:

TASK PACKAGE 1: USES OF LINES

If you should feel confident enough to pass a comprehensive test at this time, contact your instructor. However, should you feel you are not ready to be tested, begin your work as outlined above.

DC-IV-1

UNIT IV: DRAFTSMAN'S ALPHABET OF LINES

TASK PACKAGE # 1: USES OF LINES

PREREQUISITES: UNITS I - III

RATIONALE:

You know the alphabet of letters, but do you know that the draftsman has an alphabet of lines?

We have found that drafting is a graphical language. Do you know that even the lines drawn by a draftsman have a purpose? Each line has a job to do. From the very first stroke of the pencil to the very last stroke, a draftsman conveys meaning through the lines he uses. If he uses a line incorrectly he will misguide the person who reads his drawing.

The conquest of this skill is another important step in the direction of becoming a competent draftsman. If you enjoy creativity with lines, you should develop into a good draftsman.

OBJECTIVE:

Upon completion of this task package you will be able to accurately list, from a series of illustrations, the following draftsman's alphabet of lines:

a. object or visible line.

c. hidden line.

d. section line.

e. center line.

f. extension and dimension line.

g. cutting plane line.

h. short and long broken line.

i. phantom line.

You will be evaluated on a written test involving the naming of lines from illustrations.

LEARNING ACTIVITY:

1. Read pages 19-21 and page 83 in Basic Technical Drawing, and pages 4-8 of this task package.
2. Review sound-slide presentation DC-IV-1.
3. Look at Figure 34 on page 20 in your textbook.
4. What is the purpose of a phantom line? _____

_____

LEARNING ACTIVITY (cont'd):

5. What is the purpose of the visible line?_____

_____

6. What is the purpose of the construction line?_____

_____

7. Which is the extension line and which is the dimension line?

_____

_____

8. How many types of break lines are there listed in Figure 34?

_____

9. What kind of a line is a hidden line?_____

_____

10. Read the attached pages of the task package.

11. What is the purpose of a hidden line?_____

LEARNING PRACTICE:

DIRECTIONS: Read through the Learning Practice completely before starting to work.

1. Follow the directions on page 9 of this task package, entitled Identification of Line Symbols, and complete the problem. Draw guide lines for your lettering 1/8" high.

2. Remember, lines are identified by their width and density (darkness), not by a label. From this point on, the alphabet of lines will play a major role in your grade.

INFORMATION:

In making a part presentation, the draftsman arranges the views in a particular manner. Line characteristics, such as width, breaks in the line, or zigzags have definite meaning. These lines convey certain meaning to the workman machining or building the part.

Kinds of Lines

Many times in starting a drawing, the draftsman starts with center lines. CENTER LINES are composed of long and short, alternate and evenly spaced, thin sharp lines. This line is used to indicate the center of a circle or arc on a view.

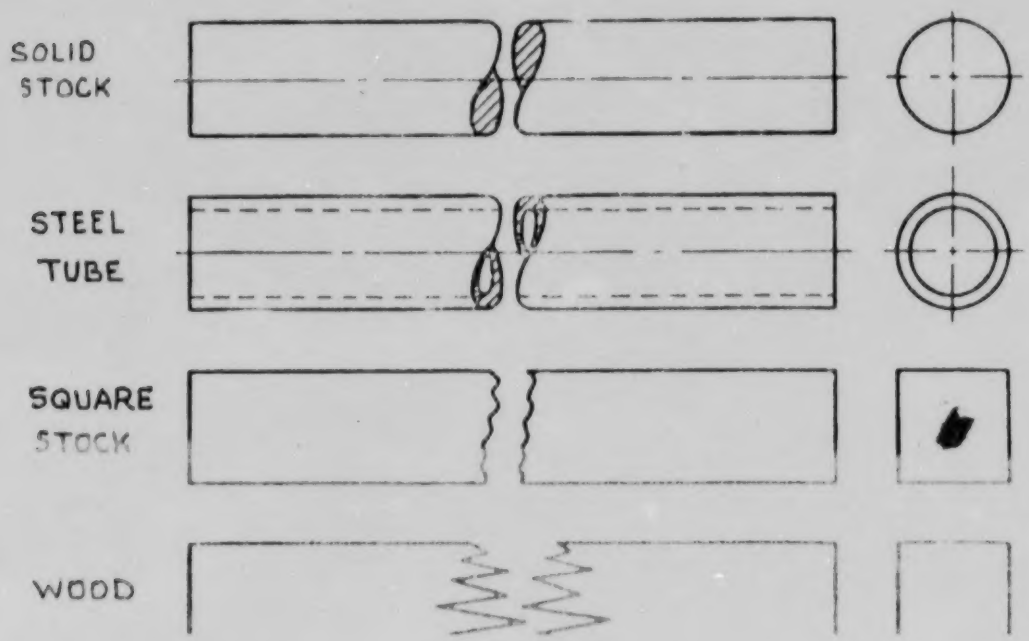
OBJECT LINES or VISIBLE LINES are slightly thicker than center lines and the line quality much darker. These lines are used to define the shape of the workpiece while looking directly at the part.

HIDDEN LINES or INVISIBLE LINES are used to show hidden features of the object, and are drawn with short, evenly spaced dashes.

EXTENSION LINES are thin sharp lines with line weight of the same width as the center line. They are unbroken and their function is for the boundry lines used in conjunction with dimension lines.

BREAK LINES

The function of the break line is to shorten a drawing's length, conserving time and space, without changing the machine operator's interpretation of the drawing. Long break lines are drawn as thin, zig-zag lines and short break lines are drawn as thick, wavy lines.

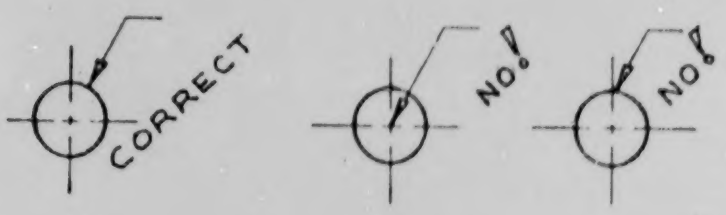


CUTTING PLANE LINES

The cutting plane line is used to indicate a plane, or planes, in which a sectional view is taken. This information will be taken up in detail in a later task package.

LEADER LINES

The leader line with an arrowhead touches the surface to which the leader refers, or to an extension line to that particular surface. It also refers to hole sizes, notes on finishes, etc. Notice the examples shown here and in your textbook.



DIMENSION LINES

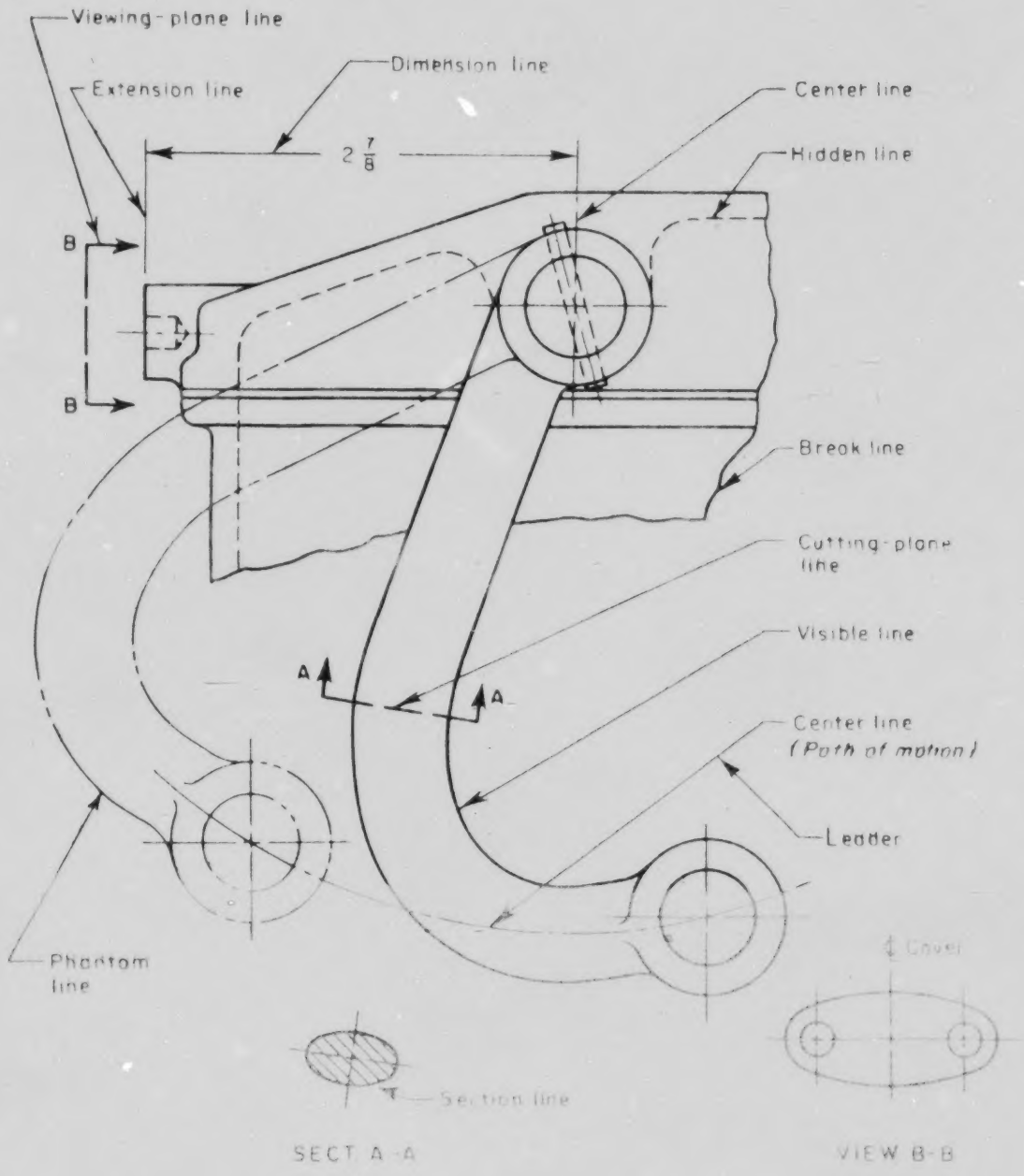
These lines indicate the length, width, etc., with figures so the machine operator can make his parts to the proper size. The dimension line terminates with an arrowhead butted against the extension line. Occasionally, when an arc or radius is to be indicated, there is an arrow at only the end of the line. Note the treatment of the radius in this drawing.

The control of line width on mechanical drawings is important in the intrepretation of the drawing. Lines done with a ruling pen and ink can be controlled much more accurately than those done with a drawing pencil. Uniform line quality is essential for reproducing drawings. The thickest lines on a regular shop drawing are the cutting plane and viewing plane lines. Lines that denote outlines of objects or other visible lines should be thick enough so they can be differentiated from hidden, extension, dimension or center lines.

One very important detail on a drawing is the arrowhead and leader line. Correctly drawn arrowheads are not drawn sloppily, or do they vary in size. The size of the arrowhead varies with the size of the drawing but all arrowheads should be the same size on a single drawing.

In most mechanical and industrial drawings, the arrowheads are solid or filled-in, and are three times longer than they are wide. Arrowheads should be drawn freehand. The following procedure shows, in steps, the construction of arrowheads. REMEMBER, PRACTICE MAKES PERFECTION.

DC-TV-1



APPLICATIONS OF LINE SYMBOLS

Courtesy of USA Standards Institute

LINE CONVENTIONS

1

2

3

4

5

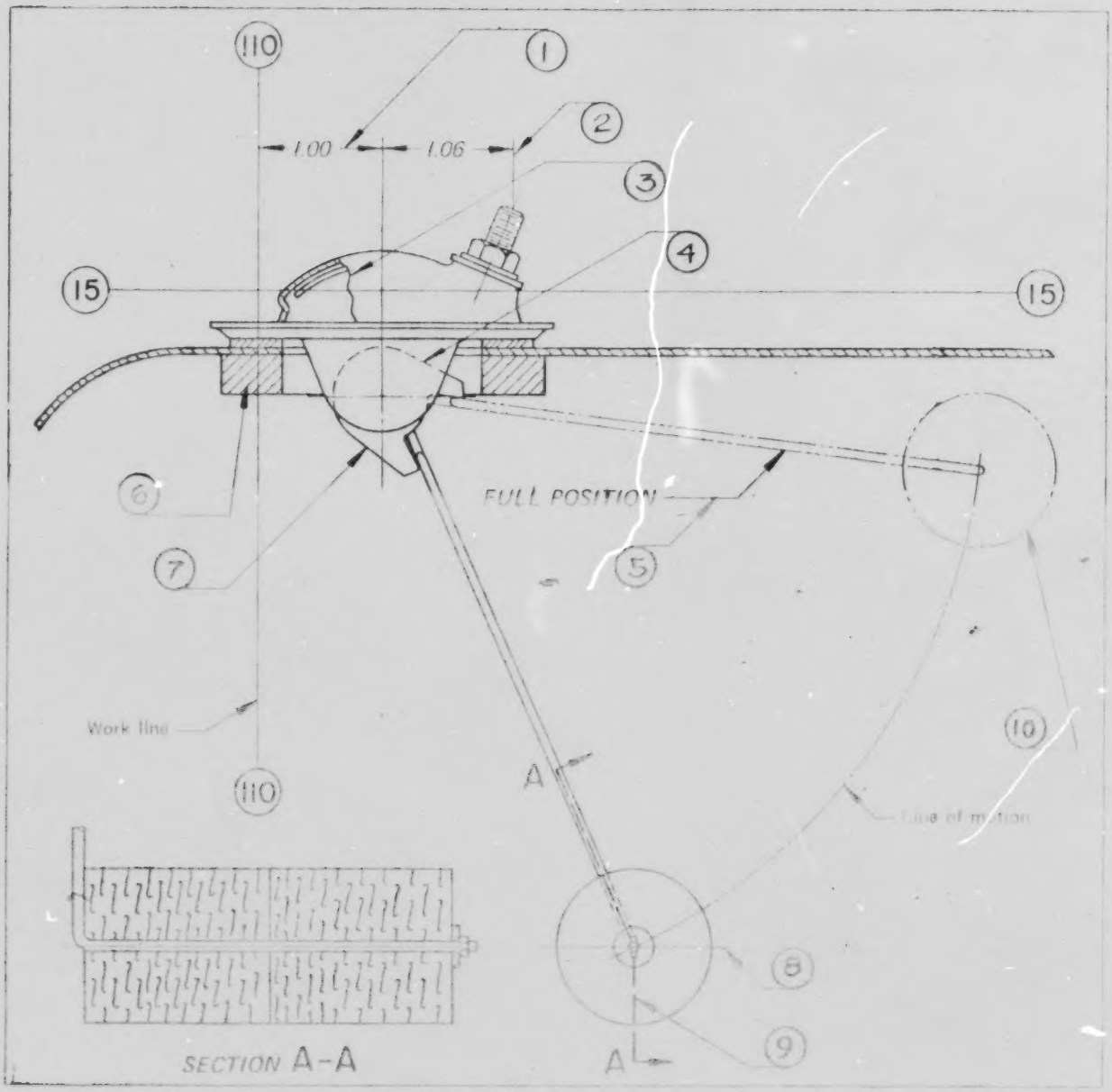
6

7

8

9

10



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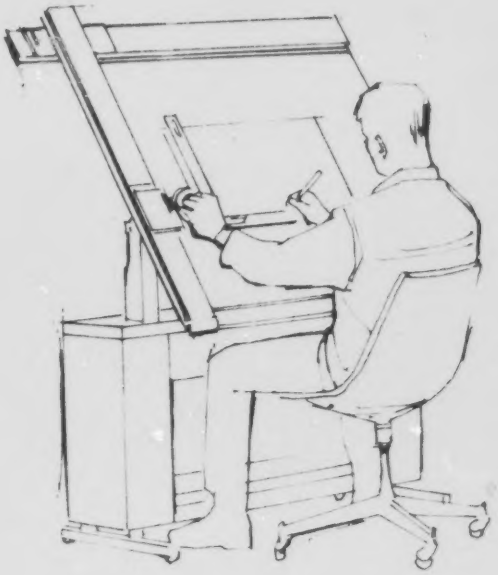
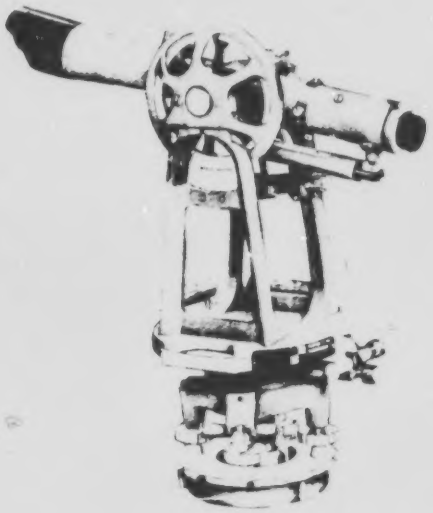
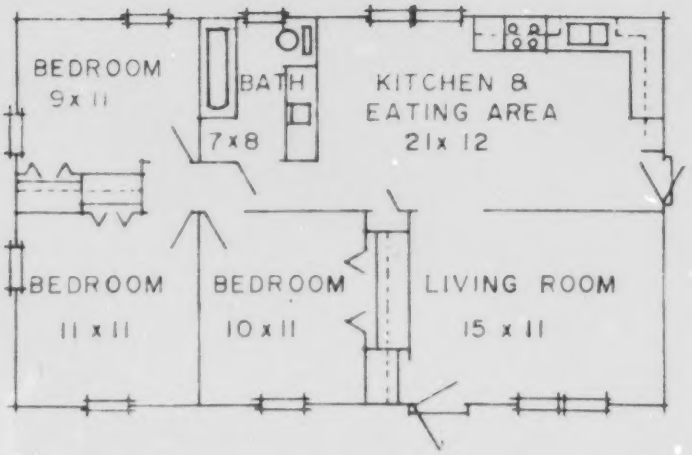






CE000393S(a)

CLUSTER: DRAFTING
COURSE: INTRODUCTION TO TECHNICAL DRAFTING

DC-V

UNIT PACKAGE 5: ORTHOGRAPHIC PROJECTION

PREREQUISITES: UNITS I, II, IV

RATIONALE:

The draftsman should be able to sketch objects at random. The ability to express one's self is a definite achievement of a draftsman. The draftsman should be able to interpret what he sees visually and be able to translate this visual picture into lines on paper.

Orthographic projection stems from sketches. The draftsman needs to know the techniques of orthographic projection and how the views are related to each other. The elements such as curved and angular surfaces have to be handled correctly when projecting them orthographically. The ability of the draftsman to take the sketches of the engineer and convert these graphical notes into drawings which are understandable is essential. The successful completion of this unit should lead you in that direction.

OBJECTIVES:

General:

Upon completion of this unit package you will be able to sketch objects correctly and convert sketches and pictorial views into views of orthographic projection which contain angular, circular, and inclined planes.

OBJECTIVES (cont'd):

Specific:

Upon completion of the task packages for this unit, you will be able to:

1. Demonstrate an understanding of the principles of freehand sketching by sketching accurately objects of various shapes. Your performance will be evaluated on the completeness of information and recognizability of the object and in accordance with the instructor's checklist.
2. Sketch views of objects using the principles of orthographic projection. Your performance will be evaluated on the basis of your sketches containing the front view, side view, and top view, with all views correctly projected and in the proper
3. Select and sketch the following:
   a. Primary views of objects.
   b. Objects requiring only two views.

   Your performance will be evaluated in accordance with the instructor's checklist.
4. Arrange and draw three views of objects using orthographic principles. Your performance will be evaluated by your instructor's checklist.

OBJECTIVES (cont'd):

5. Correctly project and draw hidden surfaces of objects in orthographic projection. Your performance will be evaluated on the basis of projecting accurately all the hidden lines in the views.
6. Project and draw objects with inclined edges using orthographic projection. Your performance will be evaluated on your ability to accurately include all inclined edges, and in accordance with the instructor's checklist.
7. Project and draw objects with cylindrical surfaces using orthographic projection. Your performance will be evaluated on your ability to include all cylindrical surfaces and in accordance with the instructor's checklist.

LEARNING ACTIVITY:

In order to complete this unit successfully you should begin your work on Task Package 1, and then as a suggestion proceed to complete each task package in order until you have finished each package in this unit. In the packages you will be asked to view a sound-slide presentation, read and answer questions, and perform some practical exercises. The number and names of the task packages included in this unit are as follows:

TASK PACKAGE 1: PRINCIPLES OF FREEHAND SKETCHING

TASK PACKAGE 2: SKETCHING VIEWS OF OBJECTS

LEARNING ACTIVITY (cont'd):

TASK PACKAGE 3: SELECTION AND SKETCHING OF PRIMARY VIEWS AND OBJECTS REQUIRING ONLY TWO VIEWS

TASK PACKAGE 4: ARRANGEMENT AND DRAWING OF THREE VIEWS IN ORTHOGRAPHIC PROJECTION

TASK PACKAGE 5: HIDDEN SURFACES IN ORTHOGRAPHIC VIEWS

TASK PACKAGE 6: INCLINED SURFACES IN ORTHOGRAPHIC PROJECTION

TASK PACKAGE 7: CYLINDRICAL SURFACES IN ORTHOGRAPHIC PROJECTION

If you should feel confident enough to pass a comprehensive test at this time, contact your instructor. However, should you feel you are not ready to be tested, begin your work as outlined above.

DC-V-1

UNIT V: ORTHOGRAPHIC PROJECTION

TASK PACKAGE #1: PRINCIPLES OF FREEHAND SKETCHING

PREREQUISITES: NONE

RATIONALE:

The first feel of drafting that you will encounter is that of sketching. Sketches play an important role in the field of engineering. Ideas are first expressed as sketches by engineers and draftsmen.

The ability to sketch correctly and quickly will be beneficial to you as a draftsman. There are no mechanical tools used in sketching, just a pencil, eraser and some paper. Just as in developing other skills in drafting, sketching takes practice and concentrated effort.

Sketching will help lead you into orthographic projection. It will give you an additional "tool" to add to your "bag of skills." So take pen in hand, not too tightly though, and sketch along for fun and profit.

OBJECTIVE:

Upon completion of this task package you will be able to demonstrate an understanding of the principles of freehand sketching by sketching accurately objects of various shapes. Your performance will be evaluated on the completeness of information and recognizability of the object and in accordance with the instructor's check list.

LEARNING ACTIVITY:

1. Read pages 5-13 in Basic Technical Drawing.
2. Review slide-sound presentation DC-V-1.
3. What are the three objects required for sketching? _____
4. A freehand line has what quality? _____
5. Describe an ellipse. _____
6. What are the two methods for sketching circles? _____
7. What is the secret of sketching? _____
8. What is meant by saying a drawing is in proportion? _____

LEARNING ACTIVITY (cont'd):

9. What is the main point about drawing a straight line?

---

10. Smile! You've just finished another Learning Activity!!

Take your answers to your instructor.

LEARNING PRACTICE:

DIRECTIONS: Read through the Learning Practice completely before starting to work.

1. Obtain two sheets of drawing paper from your instructor.
2. Using the sheet attached in this package with the collar, wedge and V-block sketched on it, sketch these objects in the space provided on the sheet. You will be required to sketch two views of each object, one view using grid lines and the other without grid lines. Apply the principles of sketching.
3. Turn to page 13 in your textbook, and sketch figure 22.
4. Following the instructions given in section 17 on page 12 in your textbook, sketch the stamping in figure 22, using a layout in accordance with section 17 on page 12.
5. Prepare the second sheet of paper using the layout that you used in 4 above.
6. Turn to page 6 in this task package and look at the drawing titled Figure 1.

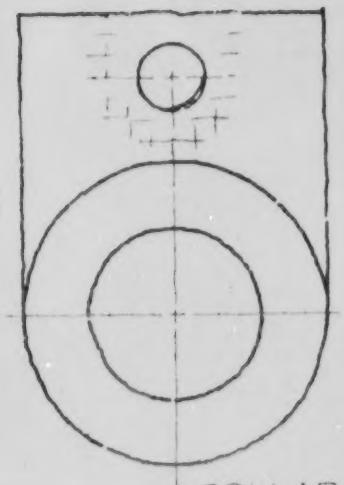
LEARNING PRACTICE (cont'd):

7. Sketch "Figure 1" full size and center it on your drawing paper. Do not place dimensions on your sketch.

8. Nothing to it, right!! You've finished another task package. Take all your sketches to the instructor for evaluation.

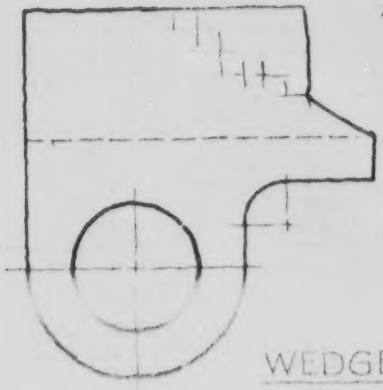
PC-V-4

1.



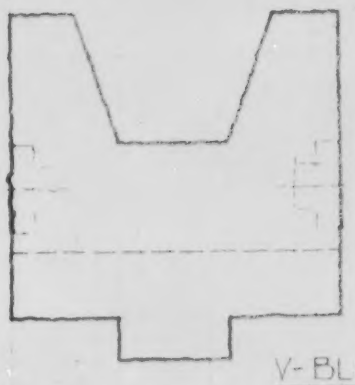
COLLAR

2.



WEDGE

3.



V-BLOCK

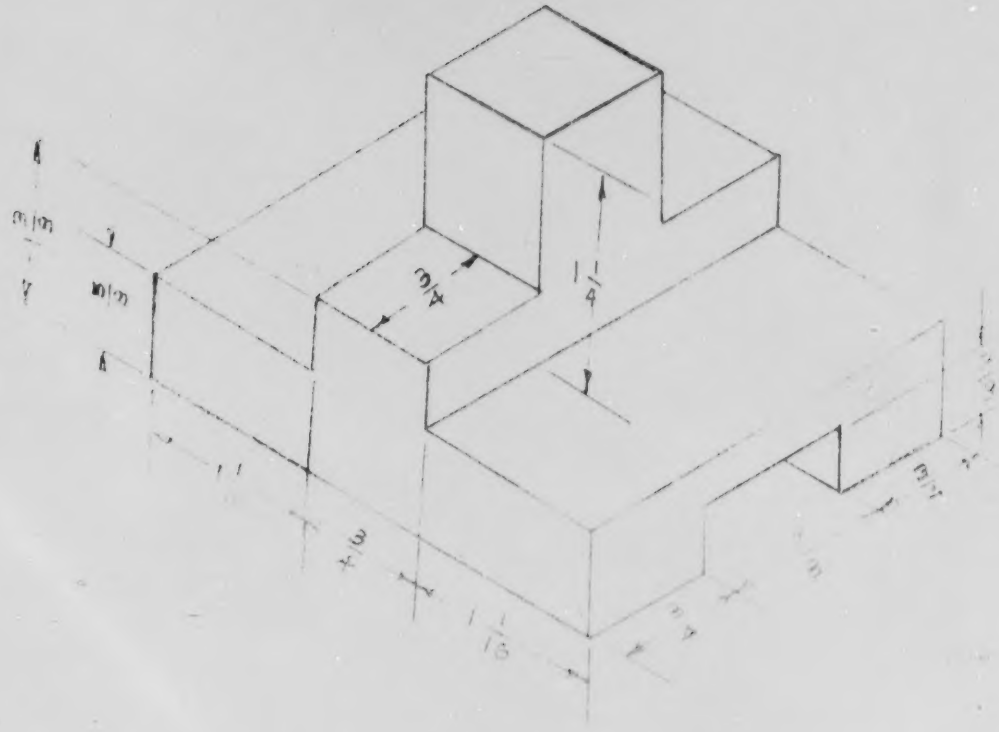


FIGURE 1.

DC-V-2

UNIT V: ORTHOGRAPHIC PROJECTION

TASK PACKAGE # 2: SKETCHING VIEWS OF OBJECTS

PREREQUISITES: NONE

RATIONALE:

The world we live in is multi-dimensional. The paper on which you will make a representation of an object is two-dimensional (a single flat plane). To help indicate that an object is really three dimensional an artist can use light and dark shades and color. A draftsman is limited to lines. To indicate the three dimensions of an object in line alone, draftsmen have adopted a number of conventions. Using these, a draftsman can be sure that anyone who knows the conventions can look at his drawing and comprehend what is portrayed.

Orthographic projection means right-angular, or perpendicular projection, and its principles can be readily understood. A drawing must show more than one side (view) of an object if the sides are different. It must also be drawn carefully to scale if it is to convey to a workman the exact dimensions of an object.

OBJECTIVE:

Upon completion of this task package you will be able to sketch views of objects using the principles of orthographic projection. You will be evaluated on the basis of your sketches' containing the front view, side view, top view, with all views correctly projected and in the proper order.

LEARNING ACTIVITY:

1. Read pages 72-78, pages 81 and 82 and paragraph 101 on page 95 in Basic Technical Drawing.
2. Review the sound-slide presentation DC-V-2 and filmstrips FS691791 and FS691794.
3. What are the three views or plans of an object that are drawn?

   _____

4. What are the three principal dimensions of an object?

   _____

5. How many views may an object have? _____
6. Look at figure 182 on page 77 in your textbook.
7. What view is above the front view? _____
8. What view is to the right of the front view? _____
9. Do the front view and the back view show the same information?

   _____

LEARNING ACTIVITY (cont'd):

12. What dimensions does the top view show? _____

_____

13. Look at figure 192 on page 82 in your textbook.

14. What are the three views shown? _____

_____

15. How many of your friends can sketch accurately? Another Learning Activity finished!

Take your answers to the instructor.

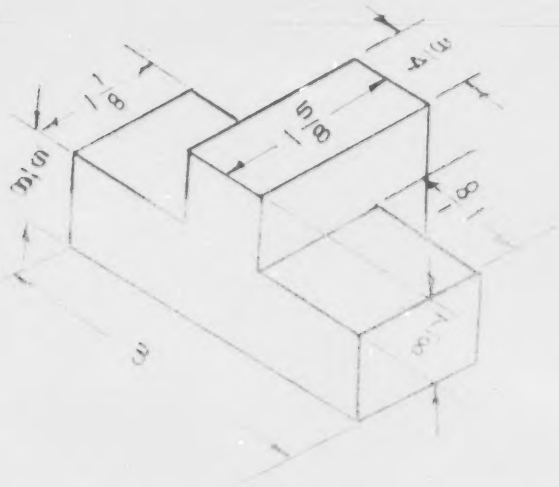
LEARNING PRACTICE:

DIRECTIONS: Read through the entire Learning Practice before starting to work.

1. Look at the sheets attached to this task package.
2. On page 5, sketch the top, front and side views of the objects shown in the area beside the objects. (The short paper will help you sketch the blocks in proportion. Use the blocks as a form of measurement.)
3. Obtain a sheet of drawing paper from your instructor. Study Figure 211 and re-read paragraph 101 on page 95 of your textbook.

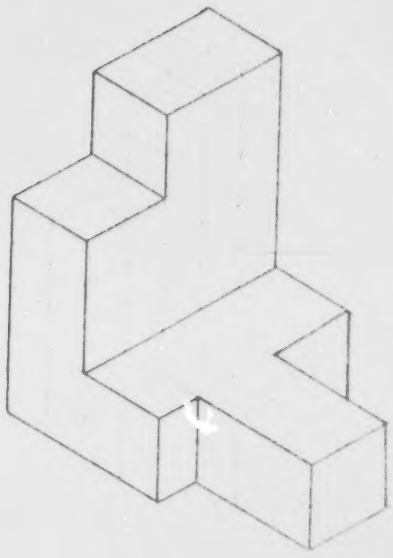
LEARNING PRACTICE (cont'd):

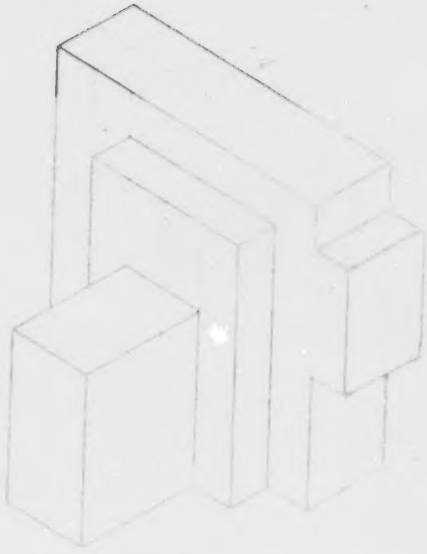
7. Prepare your sheet of paper using layout "A", using your instruments, keeping in mind the procedure for placement of three views on a sheet of paper.
8. Look at problem #1 on this page.
9. Sketch three views of problem #1 using correct orthographic projection.
10. Could you believe this could be so much fun? Take your sketches to the instructor for evaluation.



PROBLEM #1 - STOP BLOCK

DC - V - 2





DC-V-3

UNIT V: ORTHOGRAPHIC PROJECTION

TASK PACKAGE #3: SELECTION AND SKETCHING OF PRIMARY VIEWS AND OBJECTS REQUIRING ONLY TWO VIEWS.

PREREQUISITES: UNIT V, TASK PACKAGES 1 - 2

RATIONALE:

You have become aware now that a draftsman uses a uniform method of expressing himself graphically. In this package you will see that a draftsman is a specialist in his own area. He learns to communicate using views of objects and he can express a thought with as few as two views.

This package will show you that a draftsman's language is not really difficult but simple and concise. As all common objects have three dimensions - length, width and thickness - it stands to reason that, in order to represent an object accurately, one must make three views of that object on the finished drawing so as to include all dimensions. If an object is of such shape that any two of the three dimensions are the same (such as a cylinder), then two views are sufficient.

So, let's "view" this new task package.

OBJECTIVE:

Upon the completion of this task package you will be able to select and sketch the following:

a. Primary views of objects

b. Objects requiring only two views

You will be evaluated according to the instructor's check list.

LEARNING ACTIVITY:

1. Read pages 76 - 80 in Basic Technical Drawing.
2. Review the filmstrip and slide presentations - DC 5-3, FS 691791, and 691794. Which views are really needed to be drawn in orthographic projection? (Write answers to this and subsequent questions in spaces provided). _____

_____

3. Look at Figure 182 on page 77 in your textbook.
4. What views always show the depth of an object? _____

_____

5. Why are some objects drawn with only two views shown? _____

_____

6. Look at Figure 188 on page 80 in your textbook.
7. Why is (b), in the illustration, a good choice of views and (c) is not? _____

LEARNING ACTIVITY (cont'd):

8. What is the worst mistake you can make in technical drawing?

_____

9. Look at Figure 191 on page 81 in your textbook.

10. Why is (b), in the illustration, a better example of views than (c) and (d)? _____

_____

11. What three views are shown in Figure 191 (b)? _____

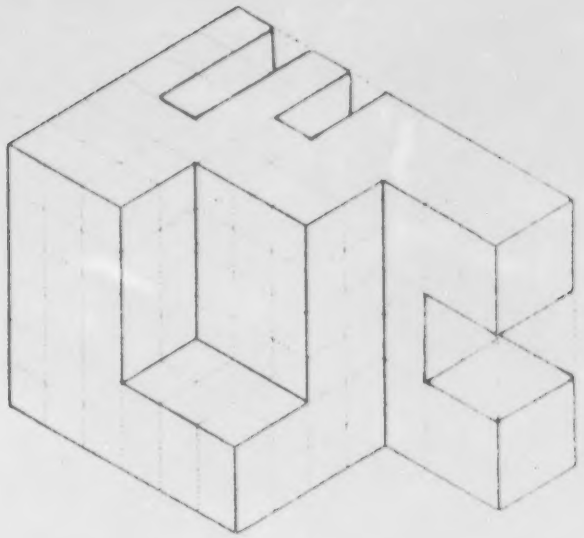
_____

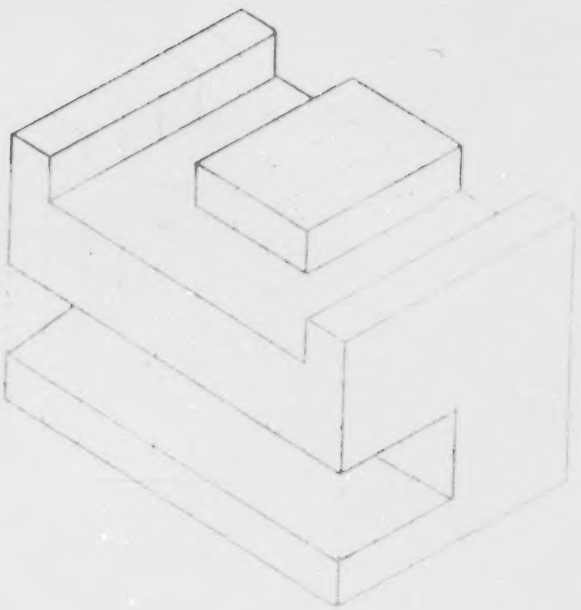
12. Congratulations! YOu've done it again!! Now take your work to the instructor to have it evaluated.

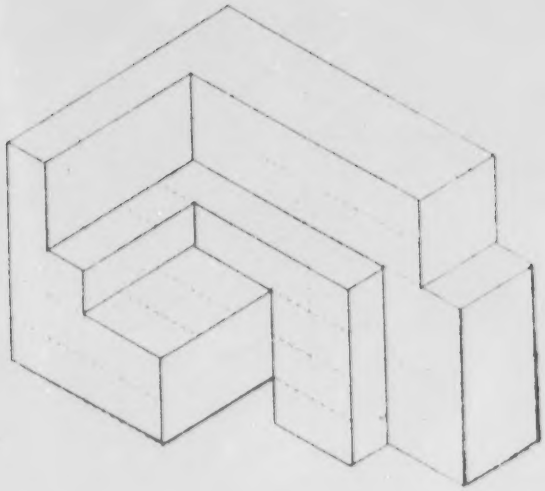
LEARNING PRACTICE:

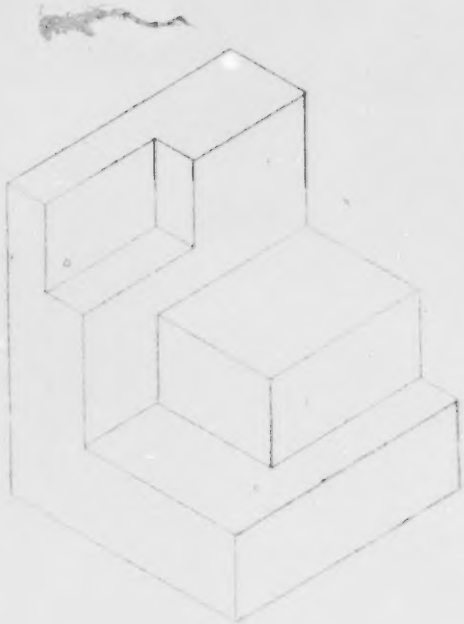
DIRECTIONS: Read through this Learning Practice completely before starting to work.

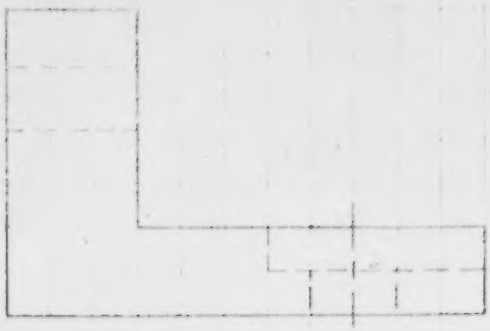
1. Look at the sheet attached sheet in this task package.
2. On sheet 4 and 5 draw the front and top views of the objects.
3. On sheet 6 draw the top views of the objects.
4. On sheet 7 draw the front views of the objects shown.
5. It's show and tell time. Show your instructor your work and he will tell you how well you have done.

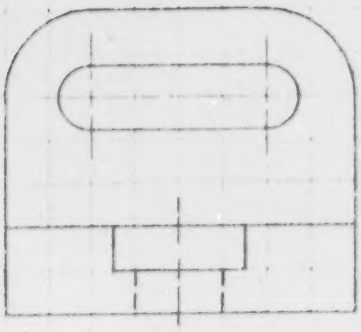


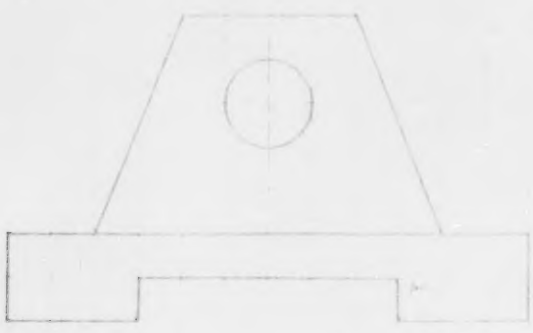


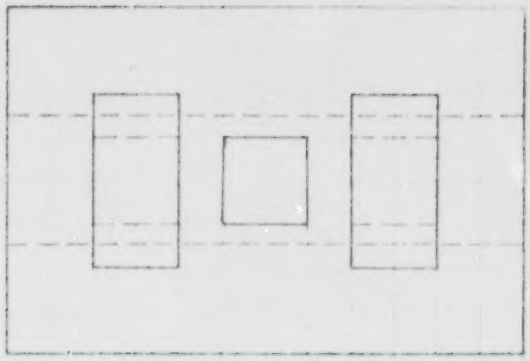


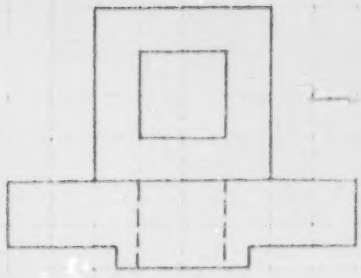


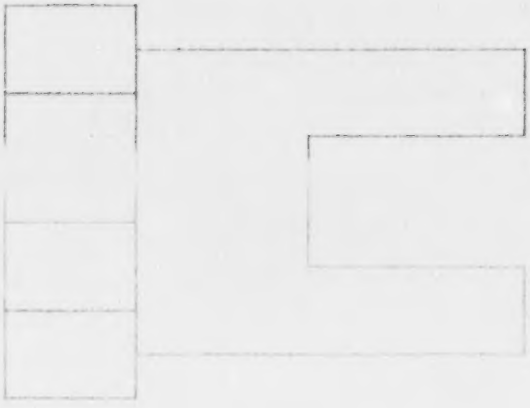












DC-V-4

UNIT V: ORTHOGRAPHIC PROJECTION

TASK PACKAGE #4: ARRANGEMENT AND DRAWING OF THREE VIEWS IN ORTHOGRAPHIC PROJECTION

PREREQUISITES: UNITS I, II, IV: UNIT V, TASK PACKAGES 1-3

RATIONALE:

We're going to explore further into your development of the skill of actually drawing objects in three views. The first packages served in giving you a foundation for the remainder of this unit. Each package from here to the end of this unit will cover a new problem in projecting objects and creating that effect of portrayal that a draftsman shows in his work. As you draw the objects in this task package, don't forget how they are placed on the paper in the correct order and how they have to be spaced to look neat and orderly.

OBJECTIVE:

Upon completion of this task package you will be able to arrange and draw three views of objects using orthographic principles. You will be evaluated by an instructor's check sheet.

LEARNING ACTIVITY:

1. Review Chapter 6, pages 72-86, in Basic Technical Drawing.
2. You've been working hard lately. What do you say we let up on the Learning Activity and dive right into the Learning Practice? It looks as though you have the "bull by the horns."

LEARNING PRACTICE:

DIRECTIONS: Read the entire Learning Practice before you start to work.

1. Obtain three sheets of drawing paper from your instructor.
2. Prepare your paper using layout "C".
   * (Remember to space the views properly on the paper. Review paragraph 101 and Figure 211 on page 95 in your textbook.)
3. Draw with your drafting equipment the front, top and side views of Figure 1 on page 4. Use the correct orthographic principles [illegible] on the paper.
4. Prepare the second sheet of paper using layout "C". (Don't forget the proper placement of the views on the paper).
5. Look at Figure 227, drawing number 1, on page 103 in your textbook.
6. Draw the front, top, and side views of the special key using your drafting equipment.
7. Prepare the third sheet of paper using layout "C".

LEARNING PRACTICE (cont'd):

8. Look at Figure 228, drawing number 1, on page 104 in your textbook.
9. Draw the front, side, and top views of the anvil, using your drafting equipment.
10. Man, you're doing great. You really know how to dig these task packages. Take your drawings to the instructor for evaluation.

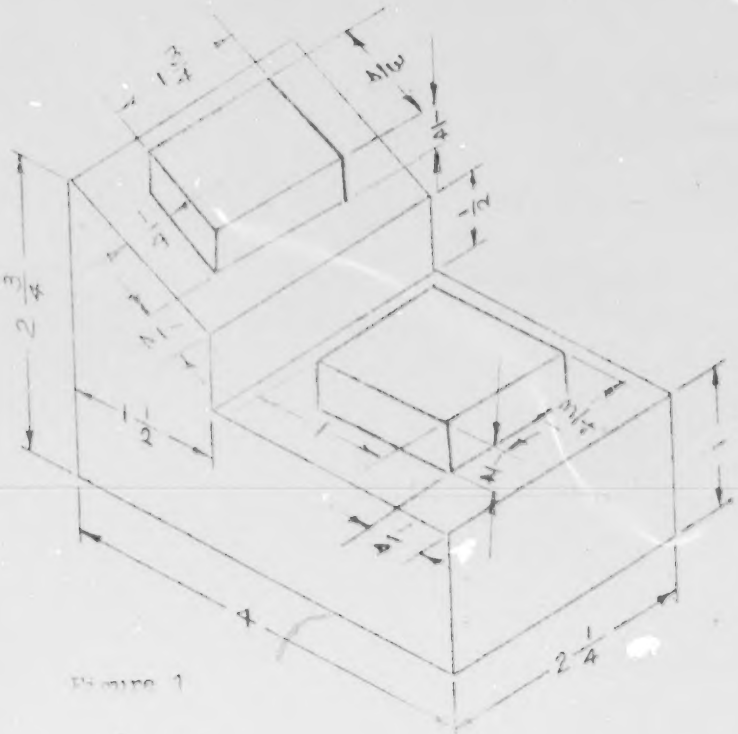


Figure 1

DC-V-5

UNIT V: ORTHOGRAPHIC PROJECTION

TASK PACKAGE 5: HIDDEN SURFACES IN ORTHOGRAPHIC VIEWS

PREREQUISITES: UNITS I, II, IV; UNIT V, TASK PACKAGES 1-3

RATIONALE:

The draftsman frequently has to draw surfaces that are hidden from view. He does this in orthographic projection by using hidden lines. These lines are dotted in the drawing and they represent surfaces that are not visible from that view. This task package concerns such hidden lines. You will be able to see the relationship between hidden lines and the complete three-view representation of objects in orthographic projection.

OBJECTIVE:

Upon completion of this task package you will be able to correctly project and draw hidden surfaces of objects in orthographic projection. You will be evaluated on the basis of projecting accurately all the hidden lines in the views.

LEARNING ACTIVITY:

1. Review pages 19-21 and Chapter 6, pages 72-86, in Basic Technical Drawing.
2. When a visible line and a hidden line coincide, which line would you show? (Answer this and subsequent questions in the spaces provided.)_____
3. Look at Figure 194 on page 83 in your textbook. Study the illustration.
4. Study the attached sheet to this task package.
5. When a hidden line and a center line coincide, which line would you show?_____

LEARNING PRACTICE:

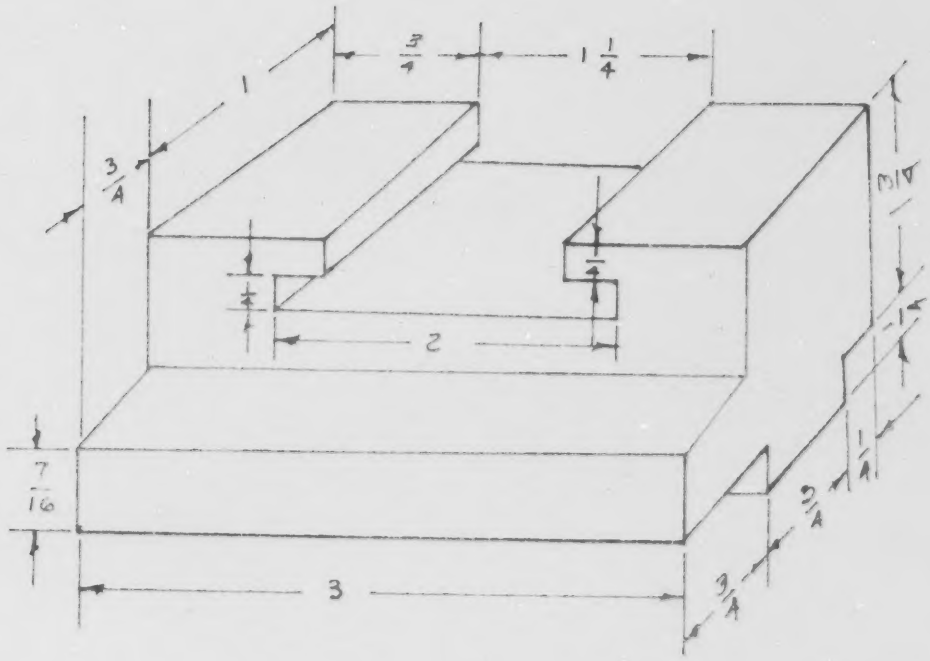
DIRECTIONS: Read the entire Learning Practice before starting to work.

1. Obtain four sheets of drawing paper from your instructor.
2. Turn to the page 4 and study the corner lock, problem #6.
4. Draw, with equipment, the necessary views that will fully explain the corner lock (problem #6). Use the correct orthographic practice and your own idea of how the lock should be drawn.
5. Prepare the second sheet of paper using Layout "C".
6. Study the cross slide, problem #8, on page 4.
7. Draw the necessary views that will fully explain the cross slide. Use the correct orthographic practice and your own idea of how the cross slide should be drawn.

LEARNING PRACTICE (cont'd):

8. Prepare the third sheet of paper using layout "C".
9. Turn to page 104 in your textbook. Study the locating finger, problem #7.
10. Draw the three views of the locating view using the proper orthographic technique.
11. Prepare the fourth sheet of paper using layout "C".
12. Turn to page 105 in your textbook. Study the operating arm, problem #3.
13. Draw three views of the operating arm using the proper orthographic technique.
14. Wouldn't you like to have a nickel for every Learning Practice? How about a pat on the back instead? Congratulations!! You've completed another one; now take your drawings to your instructor for evaluation.

DCV-5



DC-V-6

UNIT V: ORTHOGRAPHIC PROJECTION

TASK PACKAGE #6: INCLINED SURFACES IN ORTHOGRAPHIC PROJECTION

PREREQUISITES: UNITS I, II, IV; UNIT V, TASK PACKAGES 1-5

RATIONALE:

The draftsman is confronted with various lines, points, and contours in his daily activity. One specific area the draftsman is concerned with is that of inclined edges and planes. The ability to project these points and planes will serve to benefit you in drawing objects that have inclined edges. Study carefully the Learning Activity and take note of the different illustrations that explain the projection of inclined edges. Success with this task package can be yours if you are "inclined" to "project" yourself in that direction.

OBJECTIVE:

Upon completion of this task package you will be able to project and draw objects with inclined edges using orthographic projection. Your performance will be evaluated on your ability to include all inclined edges and in accordance with the instructor's check list.

LEARNING ACTIVITY:

1. Read pages 90 - 98 in Basic Technical Drawing.
2. Study the illustrations in Figure 210 on page 94.
3. What are the three methods for transferring depth dimension?

---

4. Study the illustrations in Figure 211 on page 95.
5. Notice in Figure 211 how the views are properly spaced on the drawing sheet.
6. Study the illustrations in Figure 212 on page 96.
7. Notice the steps used in the mechanical drawing of three views.
8. Study the illustration in Figure 214 on page 97.
9. Notice how the points are projected from one view to the next.
10. You can see in Figure 214 how from two complete views you can [illegible] to draw the third view.
11. Nothing to it, but to do it, and you've done it. Another Learning Activity. Check with your instructor on your performance.

LEARNING PRACTICE:

DIRECTIONS: Read through the entire Learning Practice before starting to work.

1. Obtain two sheets of drawing paper from your instructor.

LEARNING PRACTICE (cont'd):

2. Prepare a sheet of paper using layout "C".
3. Draw three views of the locator, problem #6, on page 104 in your textbook. Use the proper orthographic principles to project the inclined edge.
4. Prepare your second sheet of paper using layout "C".
5. Draw three views of the slide problem #8, on page 104 in your textbook. Use the proper orthographic principles to project the inclined edges.
6. This is a package generation and you have qualified by completing another package. Take your work to the instructor for evaluation.

DC-V-7

UNIT V: ORTHOGRAPHIC PROJECTION

TASK PACKAGE # 7: CYLINDRICAL SURFACE IN ORTHOGRAPHIC PROJECTION

PREREQUISITES: UNITS I, II, IV; UNIT V, TASK PACKAGES # 1 - 6

RATIONALE:

You have come into contact with inclined planes and hidden edges. The last task package will be devoted to cylindrical surfaces. Many cylinorical, conical and spherical objects are contained within our world of drafting. Holes, bolts, and round edges are just a few we encounter daily. The draftsman must be able to project these surfaces accurately if his drawings are to be complete.

You will be able to observe how two cylinders that intersect are represented in orthographic projection. You can develop the skill to plot the points on a curve and construct the views of cylinders in orthographic projection. Success is yours "around" the corner -- of this task package.

OBJECTIVE:

Upon completion of this task package you will be able to project and draw objects with cylindrical surfaces, using orthographic projection. Your performance will be evaluated on your ability to include all cylindrical surfaces and in accordance with the instructor's check list.

LEARNING ACTIVITY:

1. Read pages 99-102 in Basic Technical Drawing.
2. Study the illustrations in figure 218 in your textbook.
3. Note carefully the difference between cylindrical, conical and spherical objects.
4. Study the illustrations in figure 219 on page 99 in your textbook.
5. See the relationship of the curved edge to the three views in your textbook.
6. Study the illustrations in figure 220 on page 100 in your textbook.
7. You notice how closely related the illustrations in figure 220 are to the illustrations in figure 219.
8. Study the illustrations in figure 221, on page 100 in your textbook.
9. Some of the curved surfaces do not show on some views. Did you notice that?

LEARNING ACTIVITY (cont'd):

10. Now study the illustration in Fig. 222 on page 101 in your textbook.
11. Looking at the different cylinders you can see how the size of a cylinder will affect the way it looks when drawn in orthographic projection.
12. Do you have any questions? If so, check with your instructor. He'll be glad to give you assistance.

LEARNING PRACTICE:

DIRECTIONS: Read through the entire Learning Practice before starting to work.

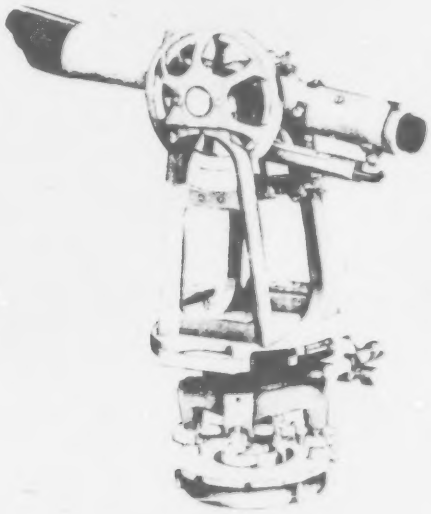
1. Obtain two sheets of paper from your instructor.
2. Prepare your paper using layout "C".
3. Turn to page 105 in your textbook. Study the frame guide, problem #7.
4. Draw three views of the frame guide, problem #7, using proper orthographic principles to project the cylindrical surfaces.

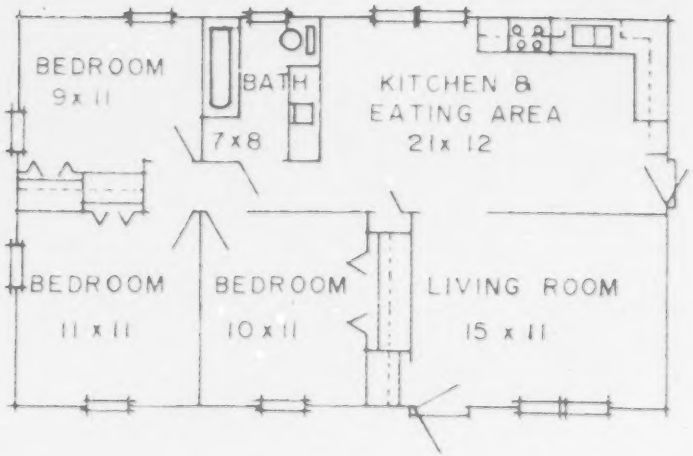
RESEARCH PROJECT

SANFORD CENTRAL HIGH SCHOOL

1708 NASH STREET

SANFORD, NORTH CAROLINA 27330





CLUSTER: DRAFTING

COURSE: INTRODUCTION TO TECHNICAL DRAFTING

CE003935(8)

DC-VI

UNIT PACKAGE VI: DIMENSIONS AND NOTES

PREREQUISITES: UNITS I, III, IV, V

RATIONALE:

The draftsman after sketching or drawing an object needs to add another element to the views to help clarify and establish his ideas. Size and shape description, or dimensions, is an important item contained on a drawing. The area of dimensions includes such items as location dimensions, notes, special instructions and drafting terms. Incorporated on a drawing you will find items such as arrowhead leaders, angular dimensions and fillets. The draftsman has to unify all these items plus the views into a concise, understandable presentation of his ideas.

[illegible] and complete these packages so that you can succeed in the attainment of the Objectives.

OBJECTIVES:

GENERAL:

Upon completion of this unit package you will be able to dimension objects using the aligned and unidirectional methods of dimensioning and be able to use notes, arrowheads, leaders and angular dimensions as prescribed by your textbook.

SPECIFIC:

Upon completion of the task packages for this unit, you will be [illegible]

OBJECTIVES (cont'd):

1. Use both the aligned and the unidirectional method of dimensions to do the following:
   a. place dimensions.
   b. dimension arcs.
   c. dimension contours.
   d. dimension curves.

   Your performance will be evaluated on the basis of all dimensions being consistent with figures 288, 289, 290, 295 and 301 in Basic Technical Drawing in accordance with the instructor's checklist.
2. Draw correctly arrowheads, leaders, fillers, radii, rounds and angular dimensions used in drafting. Your performance will be evaluated on the basis of [illegible] figures 282, 283, 286, 287 and 308, on pages 133 - 134 in Basic Technical Drawing and in accordance with the instructor's checklist.
3. Use in dimensioning an [illegible] notes, special instructions and drafting terms. Your performance will be evaluated in accordance with the instructor's checklist.
4. Dimension various objects using the following principles:
   a. location dimensions.
   b. tolerances between mating surfaces.

   Your performance will be evaluated on the basis of your adherence

OBJECTIVES (cont'd):

to figures 297, 298 and 299 on pages 130-131 in Basic Technical Drawing, and in accordance with the instructor's checklist.

LEARNING ACTIVITY:

In order to complete this unit successfully you should begin your work on Task Package 1, and then as a suggestion proceed to complete each task package in order until you have finished each package in this unit. In the packages you will be asked to view a sound-slide presentation, read and answer questions, and perform some practical exercise. The number and names of the task packages included in this unit are as follows:

TASK PACKAGE 1: DIMENSIONS OF OBJECTS

TASK PACKAGE 2: ARROWHEADS, LEADERS, FILLETS, RADII, ROUNDS

TASK PACKAGE 3: NOTES, SPECIFICATIONS AND DRAFTING TERMS

TASK PACKAGE 4: LOCATING DIMENSIONS AND TOLERANCES

If you should feel you are ready to take a comprehensive test at this time, contact your instructor. However, should you feel you are not ready to take the test, complete the activities listed above.

DC-VI-1

UNIT VI: DIMENSIONS AND NOTES

TASK PACKAGE #1: DIMENSIONS OF OBJECTS

PREREQUISITES: UNITS I, III, IV, V

RATIONALE:

The world around us has shape and size. The desk we sit on, the vehicle we ride in and even the clothes we wear - all have sizes. We as draftsmen have to be aware of these sizes. The word size to a draftsman means one thing - dimensions. This is our topic for this task package. The dimensions of a drawing are as important as the drawing itself. The combination of the drawing, the dimensions, and the notes is the basis of mechanical drawing.

A drawing by itself may be of little value unless accompanied by the dimensions to convey the total concept. Each task package in this unit should [illegible] dimension an object your actions are automatic. So come along and let's explore another "dimension."

OBJECTIVE:

Upon completion of this task package you will be able to use both the aligned and the unidirectional methods of dimensions to do the following:

a. place dimensions.

b. dimension arcs.

c. dimension contour.

d. dimension curves.

Your performance will be evaluated on the basis of all dimensions being consistent with figures 288, 289, 290, 299, and 301 in Basic Technical Drawing and in accordance with the instructor's checklist.

LEARNING ACTIVITY:

1. Read pages 122-124; 126-129; 132-134 in Chapter 9 of Basic Technical Drawing.
2. Review the sound-slide and filmstrip presentations DC-VI-1, FS691792 and FS 691795.
3. Study figure 304, page 134 in your textbook.
4. What is the most important concept of dimensioning contours?

   _____

5. Study figure 301, on page 132, in your textbook.

LEARNING ACTIVITY (cont'd):

6. What is the general rule for the placement of dimensions?

_____

7. Study figure 281 on page 122 in your textbook.

8. This is the correct procedure in dimensioning an object.

9. What is the difference between an extension line and a dimension line? _____

10. What are the four types of lines used in dimensioning?

_____

11. What is an important rule to remember when dimensioning with figures: _____

_____

12. Name the two methods of dimensioning an object? _____

_____

13. Look at figure 288, on page 126 in your textbook.

14. Notice closely the four methods of dimensioning arcs.

15. Look at figure 295, on page 129 in your textbook.

16. Notice that the cylindrical objects are drawn using just two views.

17. Remember that in dimensioning you omit all inch marks.

18. Study the basic rules on page 9 in this task package.

19. Aren't you glad you aren't as lazy as some people? You've finished another learning exercise. Take your answers to the instructor.

LEARNING PRACTICE:

DIRECTIONS: Read the complete Learning Practice before starting to work.

1. Obtain two sheets of drawing paper from your instructor.
2. Drawing the clamp block:
   a. Prepare your paper using layout "C".
   b. Turn to page 106 in your textbook and study Figure 230, problem #1.
   c. Draw two views of the clamp block using orthographic principles.
   d. Dimension both views of the clamp block using the unidirectional method.
   e. Remember your alphabet of lines.
3. Drawing the clamp plate:
   a. Prepare the second sheet of paper using layout "C".
   b. Turn to page 106 and study problem #2 in Figure 230.
   c. Draw two views of the clamp plate using orthographic principles.
   d. Dimension both views of the clamp plate using the aligned method.
4. Nice guys always finish! You did. Take your work to the instructor for evaluation.
5. Go after the next task package the way Snoopy goes after the Red Baron.

The following are the basic rules to use when dimensioning:

1. Dimensions must be read from the bottom or from the right hand side of drawing.

2. When possible, place dimensions between two views. The dimension can be used for both views.

3. Use the outline view for indicating the size of most parts of an object.

4. Place the smaller dimensions nearer to the view (but never closer than 1/4"). Place larger dimensions on the outside.

5. You may dimension on the left side and at the bottom of a drawing when it is necessary.

6. You may dimension on the drawing if it adds to the clarity of the dimensioning.

7. Dimension to a hidden edge (or line) only when dimensioning cylinders.

8. Indicate the overall length, height and thickness of a rectangular object.

9. When an object has rounded ends, indicate the distance between the centers. Do not give the overall lengths.

10. When an object has one rounded end, locate the center line of [illegible]. Do not give the overall length.

11. Do not repeat a dimension.

12. Never letter a numeral on a center line. Stagger the numbers when necessary.

UNIT VI: DIMENSIONS AND NOTES

TASK PACKAGE 2: ARROWHEADS, LEADERS, FILLETS, RADII, ROUNDS, AND ANGULAR DIMENSIONS

PREREQUISITES: UNITS I, II, IV, V; UNIT VI, TASK PACKAGE 1

RATIONALE:

The workman is no longer concerned with the design and engineering of the part, but is only interested in the proper execution of drawing instructions. Good dimensioning, then, is extremely important. Without complete dimensioning, the relationships of parts and drawings would be impossible. Well-formed figures and correct use of leaders and arrowheads add to the professionalism of a drawing. The correct dimensioning techniques help the tradesman understand more clearly what you are trying to say in your graphic language. Completing this package successfully will aid you in

OBJECTIVE:

Upon the completion of this task package you will be able to draw correctly arrowheads, leaders, fillets, radii, rounds, and angular dimensions used in drafting. Your performance will be evaluated on the basis of your adherence to figures 282, 283, 286, 287, and 305, pages 123-134 in Basic Technical Drawing and in accordance with the instructor's check list.

LEARNING ACTIVITY:

1. Read pages 125-126, 130-139 in chapter 9 of Basic Technical Drawing.
2. Study figure 283 on page 123 in your textbook.
3. Notice the correct method of drawing an arrowhead.
4. Study figure 287 on page 126 in your textbook.
5. Do you know the difference between a fillet and a round?. Look at figure 288 (e) on page 126.
6. See the leader pointing to the inside arc. This inside arc is called a fillet. Remember inside arcs are called fillets --- just think on the inside --- you "fill it."
7. Rounds are arcs that are formed on the outside when two edges meet. Look at figure 286 (c), page 125 in your textbook.

LEARNING ACTIVITY (cont'd):

8. Look at Figure 291 on page 127 in your textbook.
9. Review pages 124 through 127. Study the figures.
10. Congratulations, baby! You have overcome another Learning Activity. Check with your instructor; he may want to bend your ear.

LEARNING PRACTICE:

DIRECTIONS: Read the Learning Practice completely before starting to work.

1. Obtain two sheets of paper from your instructor.
2. Drawing the dovetail finger:
   a. Prepare your sheet using layout "C".
   b. Study figure 242, the dovetail finger, on page 109 in your textbook.
   c. Draw three views of the dovetail finger using proper orthographic projection.
   d. Dimension the views of the dovetail finger using the correct drafting techniques and the aligned method.
3. Drawing the packing gland:
   a. Prepare your sheet using layout "C".
   b. Study figure 239, the packing gland, on page 111 in your textbook.
   c. Draw two views of the packing gland using orthographic

LEARNING PRACTICE (cont'd):

principles.

d. Dimension both views of the packing gland using correct dimensioning techniques and the aligned method.

4. Can you believe you did this whole Learning Package? Well, you did! Give your work to the instructor so he can evaluate it.

DC-VI-3

UNIT VI: DIMENSIONS AND NOTES

TASK PACKAGE #3: NOTES, SPECIAL INSTRUCTION AND DRAFTING TERMS RELATED TO DIMENSIONS

PREREQUISITES: UNITS I, V; UNIT VI, TASK PACKAGES #1 & #2

RATIONALE:

All aboard! Train # DC-VI-3 is a short train but ready to chug along on a short trip.

The draftsman makes his language as short and to the point as possible. He therefore uses short notations to further explain a point of interest on a drawing. We said before that not only are the sizes important but also the notes used create easier understanding. Notes represent ideas in the graphical language of the draftsman.

You will have to understand certain common or basic terms that are related to the drafting field. Some of these terms are listed and defined in the back of Basic Technical Drawing. Terms such as these are used in dimensioning views of an object. So, take "heed" that "time and tide wait for no man".

OBJECTIVE:

Upon completion of this task package you will be able to use, in dimensioning an object, notes, special instructions and drafting terms. Your performance will be evaluated in accordance with the instructor's checklist.

LEARNING ACTIVITY:

1. Read chapter 9, pages 122 - 140, in Basic Technical Drawing.
2. Study figure 286 on page 125 in your textbook.
3. What is a finish mark? _____

_____

4. Where is a finish mark shown on a drawing? _____

_____

5. How should notes be lettered on the drawing sheet? _____

_____

6. Study figure 307 on page 136 in your textbook.
7. Study figures 282, 288 and 307 in Chapter 9 in your textbook.
8. Compare figure 307 on page 136 with figure 314 on page 141 in your textbook.
9. Of course you noticed how the depth of holes is dimensioned.

LEARNING ACTIVITY (cont'd):

10. Turn to page 339 in your textbook. This is a glossary of drafting terms. You will encounter some of these terms when dimensioning objects.

11. Using the glossary in the back of your textbook define the term counterbore. _____

_____

12. Define the term spotface. _____

_____

13. Define the term countersink. _____

_____

14. You have overcome another Learning Activity!! Take your answers to the instructor.

LEARNING PRACTICE:

DIRECTIONS: Read through this entire package before starting to work.

1. Obtain two sheets of drawing paper from your instructor.
2. Drawing the Roller Rest Bracket:
   a. Prepare your paper using layout "A".
   b. Turn to page 111 in your textbook. Study the Roller Rest Bracket, Figure 7-5.
   c. Draw three views of the roller rest bracket using orthographic projection.

LEARNING PRACTICE (cont'd):

d. Dimension the three views of the Roller Rest Bracket using dimensioning techniques.

3. Drawing the tailstock clamp:

a. Prepare your paper using layout "C".

b. Turn to page 107 in your textbook. Study the tailstock clamp, Figure 231, problem #2.

c. Draw three views of the tailstock clamp using orthographic projection.

d. Dimension the three views of the tailstock clamp using dimensioning techniques.

4. You know a packet learned is a packet earned and you've earned this one. Take your drawings to the instructor for evaluation.

5. Draftsmen have always made more money than draft horses.

DC-VI-4

UNIT VI: DIMENSIONS AND NOTES

TASK PACKAGE 4: LOCATION DIMENSIONING AND TOLERANCES BETWEEN MATING SURFACES

PREREQUISITES: UNIT I - V; UNIT VI, TASK PACKAGES 1 - 3

RATIONALE:

Good afternoon! Taxi DC-VI-4 is ready to take you on a tour to the location dimensions of holes. As a draftsman you need to know the proper method for locating holes on an object when you are drawing. The correct method of dimensioning improves the understanding between the draftsman and the workman. The proper techniques throughout the area of drafting help create a better form of interchangeability for industry. Be successful in this last task package of Unit VI and "locate" the Learning Activity.

OBJECTIVE:

Upon completion of this task package you will be able to dimension various objects using the following:

a. location dimensions.

b. tolerances between mating surfaces.

Your performance will be evaluated on the basis of your adherence to figures 297, 298, and 299 on pages 130 - 131 in Basic Technical Drawing and in accordance with the instructor's checklist.

LEARNING ACTIVITY:

1. Review chapter 9 in Basic Technical Drawing.
2. The show today is sound-slide presentation DC-VI-4.
3. Study pages 5-7 in the task package.
4. What is the difference in diameter between a hole and a shaft called?
5. What is the difference between the maximum and minimum dimensions?
6. What are the two things that dimensioning must do?
7. On page 7 of this package notice the different ways of locating dimensions for holes.
8. What does interchangeable manufacturing mean?
9. Explain the term location dimension
10. Study figure 297 and 298 on page 130 in your textbook.
11. Did you note the three ways they located holes about a common center in figure 298? What are they?
12. No one knows what he can do till he tries. So give your answer to the instructor and let's try a Learning Practice.

LEARNING PRACTICE:

DIRECTIONS: Read through the entire Learning Practice before starting to work.

1. Obtain three sheets of paper from your instructor.
2. Drawing the cutter holder.
   a. Prepare your paper using layout "C".
   b. Study the cutter holder shoe, figure 234, on page 108 in your textbook.
   c. Draw three views of the cutter holder shoe using orthographic principles.
   d. Dimension the three views of the cutter holder shoe using the correct dimensioning procedures.
3. Drawing the chuck jaw blank.
   a. Prepare your second sheet of paper using layout "C".
   b. Study the chuck jaw blank, figure 251, page 111 in your textbook.
   c. Draw three views of the chuck jaw blank using orthographic principles.
   d. Dimension the chuck jaw blank using the correct dimensioning procedures.

* Don't forget the correct way to show the drilled holes.

LEARNING PRACTICE (cont'd):

4. Draw the bearing cap.
   a. Prepare your third sheet of paper using layout "C".
   b. Study the bearing cap, figure 267, page 114 in your textbook.
   c. Draw three views of the bearing cap using orthographic principles.
   d. Dimension the bearing cap using the correct drafting techniques.
5. Take a bow. You've finished another task package!! Take your work to the instructor for evaluation.

The complexity of present day manufacturing requires the interchangeability and duplication of parts on such a vast scale that it would be an impossible task, without some kind of system. Limits of accuracy must then become part of this system. As you begin to understand the problems of interchangeable parts, the term accuracy becomes a relative thing. Perfectness or absolute accuracy is impossible. However, if a system is used that can control various sizes and fits, the goal of mass-production of interchangeable parts can be realized.

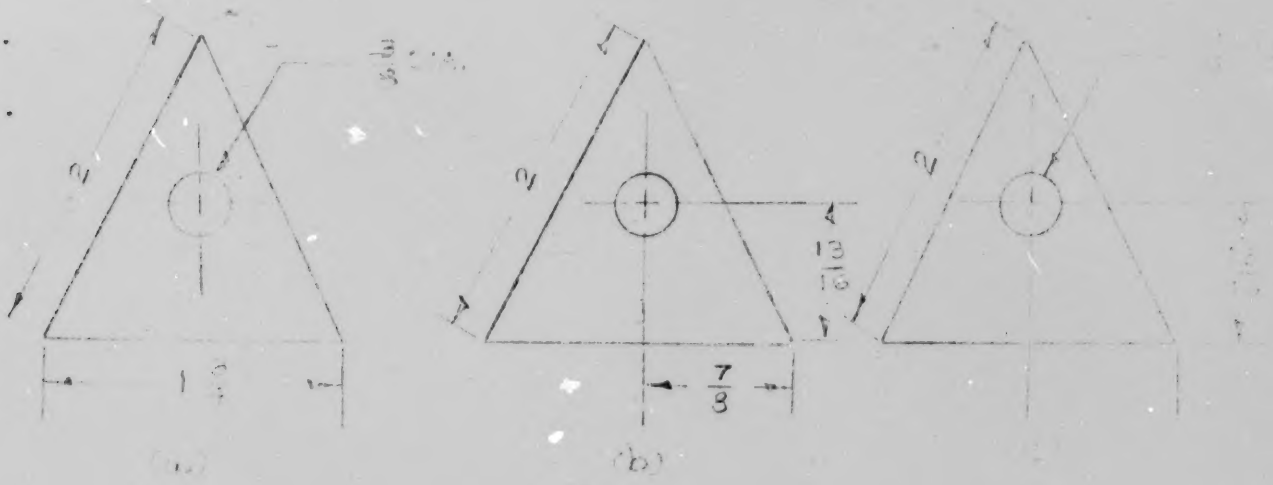
Three words you must understand regarding the dimensioning of mechanical parts are: 1) Allowance, 2) Limits, and 3) Tolerance. In dimensioning the difference in the diameter between a hole in the workpiece or part, and a shaft, for example, the amount of variance taken from compiled tables and the results of tests, would be the size allowance. The degree of accuracy required is specified by means of limits which show the amount over or under the absolute dimension that is permissible and will still allow the parts to fit. Tolerance is defined as the sum of the limits over and under the absolute size - or the difference between the maximum and minimum dimensions allowed.

Limits should not be given for all dimensions on the part drawing. Unnecessary or unreasonable accuracy demands not only complicate parts manufacturing, but increases the cost of tooling and production.

Size and Location Dimensions

There are two things that dimensioning must do. First: dimensioning must give the size of every part of the object. Second: dimensioning must give the exact location of every part of the object.

SIZE DIMENSIONS LOCATION DIMENSIONS COMPLETE DIMENSIONING

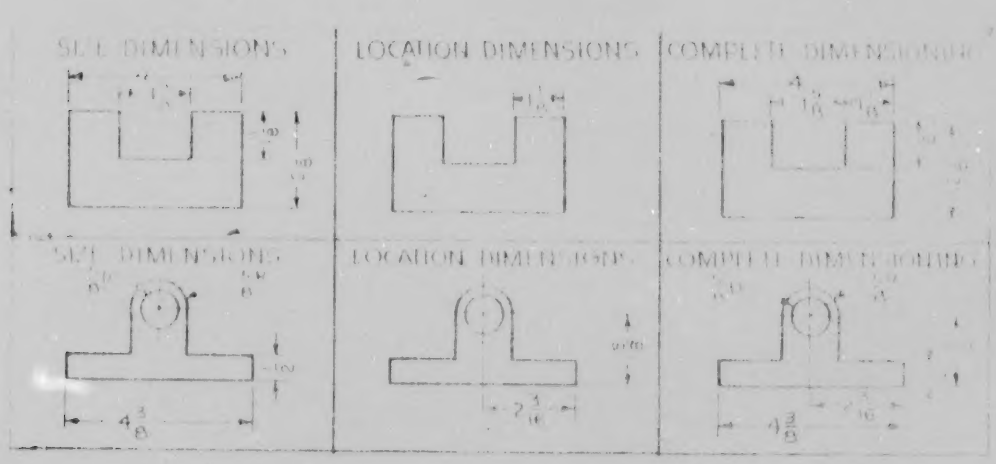


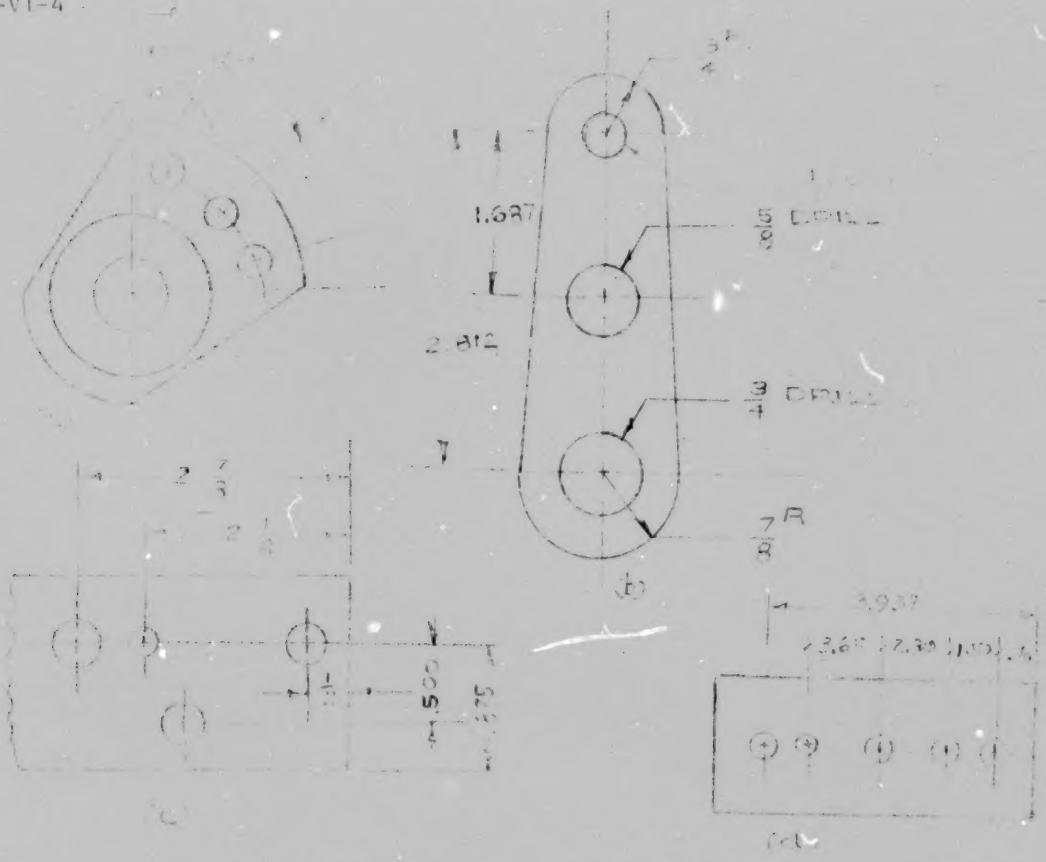
a. The length and height of the surface must be given. The size of the hole must be given.

b. The location of the center of the hole must be given by use of two dimensions.

c. Five dimensions are needed to describe this surface.

Examples of Size and Location Dimensions





Tolerance Dimensions

The dimensions which must be precise are identified by giving the maximum and minimum sizes. The maximum size is called the "upper limit" and the minimum size is called the "lower limit."

Note: The tolerance on a dimension is the amount of variation permitted between the upper and lower limits.

When external parts are dimensioned with tolerance specified as the upper limit, the dimension is placed above the dimension line. When internal parts (diameters of holes, etc.) are dimensioned with tolerance dimensions, the lower limit is placed above the dimension line.

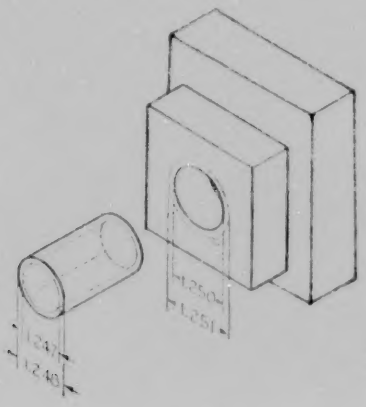


Figure 4

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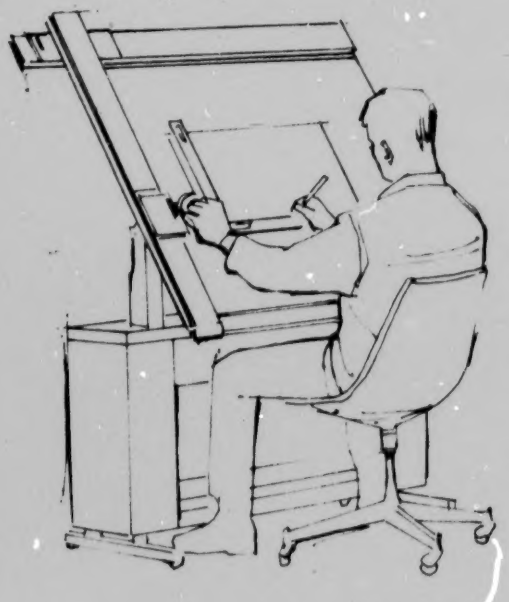
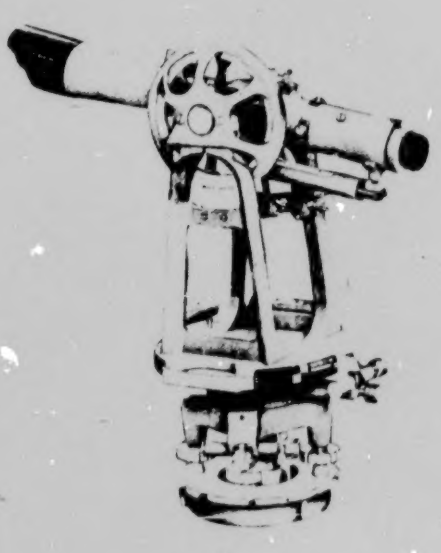
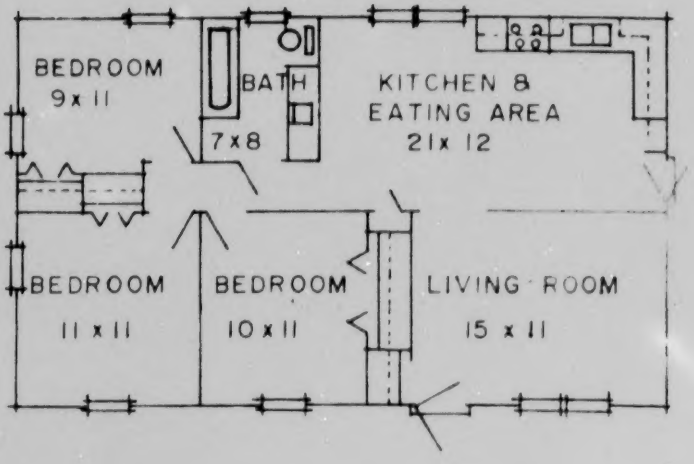






CLUSTER: DRAFTING

COURSE: INTRODUCTION TO TECHNICAL DRAFTING

CE003935 (g)

DC-VII

UNIT PACKAGE VII: SECTIONS

PREREQUISITES: UNITS I-VI

RATIONALE:

The draftsman may find that some items he draws are complicated on the inside. He, therefore, has to use some method to more fully clarify his representations. This unit will help you develop the skills necessary to section an object correctly, using the various methods that are available to the draftsman. The draftsman needs to have these skills so that he may perform his job more competently. Don't let yourself be pulled apart in sections; pull yourself together so that you can accomplish the objectives of this unit.

OBJECTIVE:

GENERAL:

Upon completion of this unit package you will be able to identify section drawings and assembly section symbols and draw objects in section, using the various techniques as outlined in your textbook.

OBJECTIVE (cont'd):

SPECIFIC:

Upon completion of the task packages for this unit, you will be able to:

1. Given a set of illustrations:
   a. identify and record all the section and assembly section symbols covered in this task package.
   b. define, in writing, section and cutting plane lines and section views.

   Your performance will be evaluated on the basis of a test on which you will have to list all the types of sections and assembly section symbols and define these types of section lines.

2. Section an object and draw the section view indicated:
   a. view in full section.
   b. view in half section.
   c. view using offset sectioning.
   d. assembly section.

   Your performance will be evaluated on the basis of figures 380-384 in Basic Technical Drawing and in accordance with the instructor's checklist.

3. Section an object and draw the view indicated:
   a. view using offset sectioning.
   b. view using revolved sectioning.

OBJECTIVE (cont'd):

c. rib, lug or web in section.

d. view using removed sectioning.

e. conventional breaks of round and tubular material.

Your performance will be evaluated on the basis of figures 385-395 and 396-399 in Basic Technical Drawing and in accordance with the instructor's checklist.

LEARNING ACTIVITY:

In order to complete this unit successfully you should begin your work on task package 1, and then as a suggestion, proceed to complete each task package in order, until you have finished each package in this unit. In the packages you will be asked to view a sound-slide presentation, read and answer questions, and perform some practical exercises. The number and names of the task packages included in this unit are as follows:

TASK PACKAGE 1: IDENTIFICATION OF SECTION DRAWING AND ASSEMBLY SECTION SYMBOLS.

TASK PACKAGE 2: FULL, HALF AND ASSEMBLY SECTIONS.

TASK PACKAGE 3: ADDITIONAL SECTIONING METHODS.

If you should feel confident enough to pass a comprehensive test at this time, contact your instructor. However, should you feel you are not ready to be tested, begin your work as outlined above.

DC-VII-1

UNIT VII: SECTIONS

TASK PACKAGE: IDENTIFICATION OF SECTION DRAWINGS AND ASSEMBLY SECTION SYMBOLS

PREREQUISITES: UNITS I-VI

RATIONALE:

The draftsman frequently finds it difficult to represent clearly the inside shape of an object by means of hidden lines on the three principal views. To make the shape description of the inside of an object easily understandable, an inside view is often used. This inside view, which is called a sectional view or "section," may take the place of one of the three principal views or it may be an additional view.

The different materials that are used in the manufacturing of machine parts have a code or symbol to represent the material on a section drawing. The draftsman needs to know these symbols so that he can communicate. "If you cannot do great things, do small things in a great way"; start with this task package.

DC-VII-1

OBJECTIVE:

Upon completion of this task package you will be able to, given a set of illustrations:

a. identify and record all of the section and assembly section symbols covered in this task package.

b. define in writing, section and cutting plane lines and section views.

Your performance will be evaluated on the basis of a test where you will have to list all the types of section and assembly section symbols and define the three types of section lines.

LEARNING ACTIVITY:

1. Read pages 164 - 173 and study figure 522 on page 239 in Basic Technical Drawing.
2. Review sound-slide presentation DC-VII-1 and filmstrip FS 691796.
3. Study figure 380 on page 164 in your textbook.
4. What is a cutting plane line? _____

_____

5. Study figure 381 on page 165 in your textbook.
6. Study figure 382 on page 165 in your textbook.
7. Study figure 383 on page 166 in your textbook.
8. Study figure 385 on page 167 in your textbook.
9. Study page 4 in this task package.

LEARNING ACTIVITY (cont'd):

10. What is a section line? _____

_____

11. Grin and bear it. Nothing lasts forever. Take your answers to the instructor.

LEARNING PRACTICE:

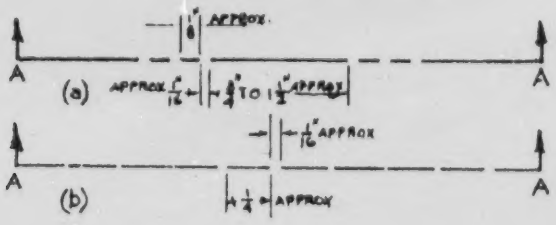
DIRECTIONS: Read through the entire package before starting to work.

1. Identify the materials in section, seen in Part I on page 5 of this task package. Write your answer in the space provided.
2. Define the terms in Part II on page 5 of this task package. Use the space provided to write the definition.

You hurdled over this hurdle and scored another victory for progress.

CUTTING PLANES

Two forms of the cutting plane are shown below. These lines are used for indicating the point from which a sectional view is obtained. Figure (A) shows the style that has been in use for many years, while (B), being composed of short dashes having the advantage of showing in a clearer manner on parts of a more complicated nature. Note the acceptable dimensions of the dash length and spacing in both illustrations. Careless execution of the cutting plane, as well as any other drafting lines could lead to costly errors.



DEFINE THE FOLLOWING:

1. Section lines _____

_____

_____

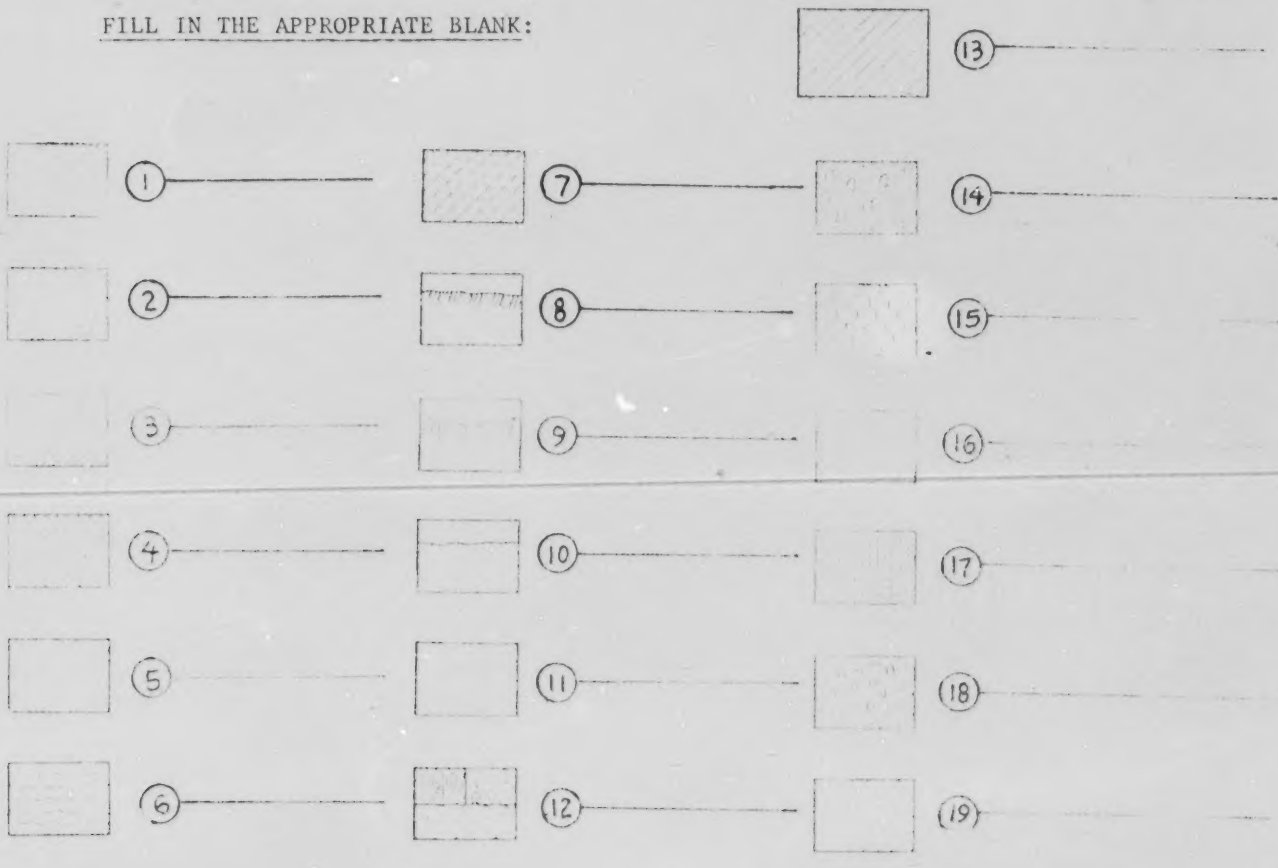
2. Cutting plane line _____

_____

3. Section view _____

_____

FILL IN THE APPROPRIATE BLANK:



DC-VII-2

UNIT VII: SECTIONS

TASK PACKAGE # 2: FULL, HALF AND ASSEMBLY SECTIONS

PREREQUISITES: UNITS I - VI; UNIT VII, TASK PACKAGE # 1

RATIONALE:

Good afternoon! Submarine DC-VII-2 sails immediately and is ready to take you on a trip below the surface of objects.

Today's adventure will cover three of the various sectioning methods you can use to show an object: the full section, the half section and the assembly section. These three types of sections are important. These views will show fully the information you need to know about an object to manufacture it. A section or sectional view is obtained by theoretically cutting away part of an object to show the shape and construction at the cutting plane.

The section views show what material will be used in the construction of the part. "Hard work will bring another task package to a close -- so get to sectioning".

OBJECTIVE:

Upon completion of this task package you will be able to section an object and draw the section view indicated:

a. A view in full section

b. A view in half section

c. A view using offset sectioning

d. An assembly section

Your performance will be evaluated on the basis of figures 380-384 in Basic Technical Drawing and in accordance with the instructor's checklist.

LEARNING ACTIVITY:

1. Review chapter 11 in Basic Technical Drawing.
2. Read pages 238-240 in Basic Technical Drawing.
3. Review the sound-slide presentation DC-VII-2.
4. Study figure 524 on page 240 in your textbook.
5. Study figure 580 on page 164 in your textbook.
6. Look carefully at part (d) of figure 380. Notice the two views of the object.
7. Study figure 384 on page 166 in your textbook.

LEARNING ACTIVITY (cont'd):

8. Look carefully at part (c) of figure 384. Notice the two views of the object. Did you see the cutting plane line in the top view?
9. In a half section, when you section, how much of the object do you actually remove?_____
10. Remember a long trip is started with just one step. You've taken that one step by finishing this Learning Activity. Take your answers to the instructor.

LEARNING PRACTICE:

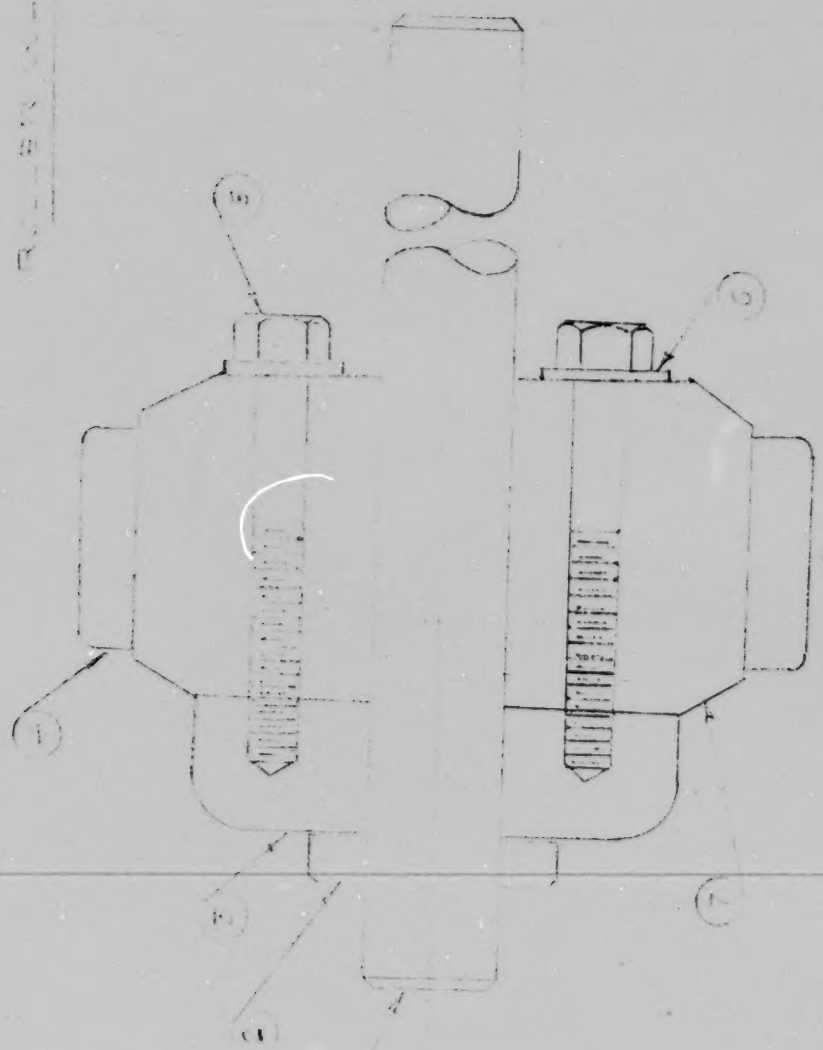
DIRECTIONS: Read through the entire Learning Practice before starting to work.

1. Obtain two sheets of drawing paper from your instructor.
2. Draw the guard block.
   a. Prepare your paper using layout "C".
   b. Study the guard block, Figure 408, on page 179 in your textbook.
   c. Remember to space your views properly. Draw the top view of the guard block.
   d. Draw sectional views A-A and B-B in full section of the guard block.
   e. Dimension the views of the guard block using the correct dimensioning techniques.

LEARNING PRACTICE (cont'd):

3. Draw the packing gland.
   a. Prepare your paper using layout "C."
   b. Study the packing gland, figure 410 on page 179 in your textbook.
   c. Remember to space your views properly. Draw the front view of the packing gland.
   d. Draw the right side view in half section.
   e. Dimension the views of the packing gland, using the correct dimensioning techniques.
4. Turn to page 5 in this task package. Use the appropriate section symbols and finish sectioning the roller wheel assembly.

Smile, and the whole world smiles with you!



DC-VII-3

UNIT VII: SECTIONS

TASK PACKAGE #3: ADDITIONAL SECTIONING METHODS

PREREQUISITES: UNITS I - VI; UNIT VII, TASK PACKAGES 1 - 2

RATIONALE:

There are many applications of section drawings in conjunction with other views of objects in providing additional parts description. The types of sections discussed in this task package are for the most part directly related to or drawn as part of the existing view of the object. They provide a clearer understanding of the inside of an object. The draftsman uses these types of sections to enhance his graphic language. So, get in the groove and "revolve" around this new task package.

OBJECTIVE:

Upon completion of this task package you will be able to section an object and draw the view indicated:

1. A view using offset sectioning.
2. A view using revolved sectioning.
3. A rib lug, or web in section.
4. A view using removed sectioning.
5. Conventional breaks of round and tubular material.

Your performance will be evaluated on the basis of figures 385-395 and 396-399 in Basic Technical Drawing and in accordance with the instructor's checklist.

LEARNING ACTIVITY:

1. Review chapter 11 in Basic Technical Drawing.
2. Review sound-slide presentation DC-VII-3.
3. Study figure 390 on page 169 in your textbook. Look at C. Notice how the offset is not shown in the sectional drawing.
4. Study figures 391, 392, and 394 on pages 170-171 in your textbook.
5. What is the difference between a solid web and a spoke in sectioning?_____

_____

LEARNING ACTIVITY (cont'd):

6. Study figure 393 on page 171 in your textbook.
7. Notice how the spokes are revolved to clarify the sectioned view.
8. Study figures 396-399 on page 172 in your textbook.
9. Look carefully at how the breaks for the solid shaft and the tubing are made.
10. Study figure 386 on page 167 in your textbook.
11. Study figures 387-389 on pages 168-169 in your textbook.
12. What is a removed section? _____

_____

13. What is an offset section? _____

_____

14. What is a revolved section? _____

_____

15. Be it ever so humble, there's nothing like finishing a new Learning Activity. "Hang five, baby" -- onto your answers, that is, while taking them to your instructor.

LEARNING PRACTICE:

DIRECTIONS: Read the entire Learning Practice before starting to work.

1. Obtain six sheets of drawing paper from your instructor.

LEARNING PRACTICE (cont'd):

2. Draw the holder base:
   a. Prepare your paper using layout "C".
   b. Study figure 406, problem 4, on page 177 in your textbook.
   c. Draw the top and right side views of the holder base as shown in the illustration.
   d. Draw an offset section of the front view of the holder base.
   e. Dimension the views using the proper techniques.
3. Draw the wrench:
   a. Prepare your paper using layout "C".
   b. Study the wrench, figure 416, page 180 in your textbook.
   c. Draw the front view of the wrench with a revolved section of the handle.
   d. Draw a partial top view showing the wrench head.
   e. Dimension the views using the proper techniques.
4. Draw the bearing:
   a. Prepare your paper using layout "C".
   b. Study the bearing, figure 415, on page 180 in your textbook.
   c. Draw the front view of the bearing.
   d. Draw a full section of the right side of the bearing.
   e. Dimension the bearing using the proper technique.
5. Draw the handwheel:
   a. Prepare your paper using layout "C".

LEARNING PRACTICE (cont'd):

b. Study the handwheel, figure 554-2 on page 258 in your textbook.

c. Draw the front view showing a revolved section of a spoke.

d. Draw a right side view in full sections.

e. Dimension all the views using the correct techniques.

6. Draw the shaft bracket:

a. Prepare your paper using layout "C".

b. Study the shaft bracket, figure 344 on page 158 in your textbook.

c. Draw the front view of the shaft bracket.

d. Draw a right side view in full section.

e. Dimension all views using correct technique.

7. Draw the guide bar:

a. Prepare your paper using layout "C".

b. Study the guide bar figure 551 (#4), on page 256 in your textbook.

c. Draw one view of the object, breaking it in the middle, using the conventional break symbol for a solid shaft.

d. Do not draw the threads on the ends. Draw the ends as being smooth.

e. Dimension the guide bar using correct technique.

8. Can you believe you did this whole thing? You did! Congratulations! Take your drawings to the instructor for evaluation.

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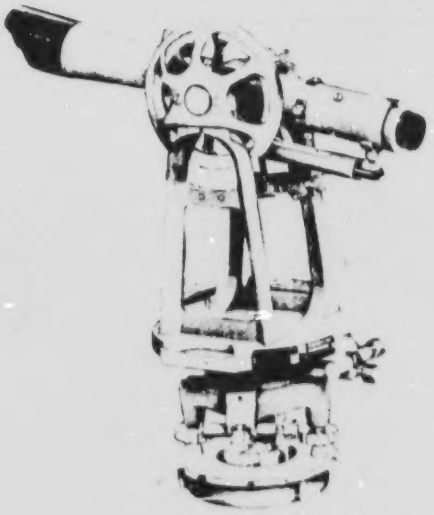

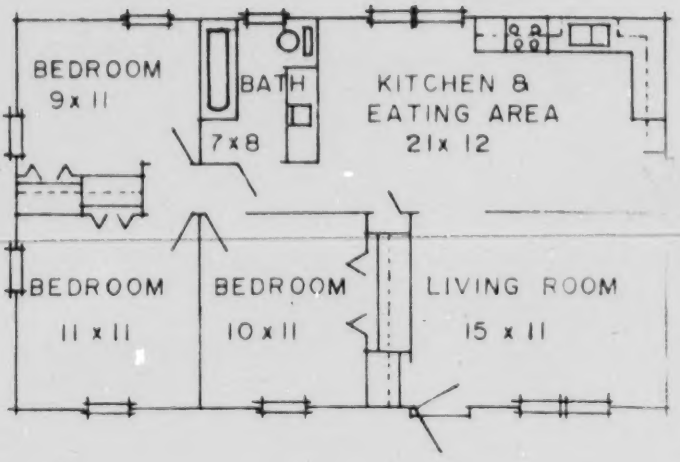

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CLUSTER: DRAFTING

COURSE: INTRODUCTION TO TECHNICAL DRAFTING

DC-VIII

UNIT VIII: AUXILIARY VIEWS

PREREQUISITES: UNITS I-VI

RATIONALE:

The draftsman needs to have available to him knowledge of auxiliary views. The draftsman may encounter some objects that contain surfaces which do not lend themselves to proper representation when projected orthographically. When a draftsman finds a problem such as this he has to revert to some means of further explaining his ideas. The auxiliary views give any additional information you may need for size and shape description. You may find you cannot complete the necessary orthographic view without first drawing an auxiliary or partial auxiliary view. Let this unit serve as an auxiliary element for your skills.

OBJECTIVES:

General:

Upon completion of this unit package you will be able to construct primary and partial auxiliary views, and you will be able to construct symmetrical, asymmetrical, and curved planes using auxiliary views.

Specific:

Upon completion of the task packages for this unit, you will be able to:

OBJECTIVES (cont'd):

1. Construct correctly a primary auxiliary view. Your performance will be evaluated on the basis of figures 421-242 on pages 181-183 in Basic Technical Drawing and in accordance with the instructor's checklist.
2. Construct a partial auxiliary view correctly. Your performance will be evaluated on the basis of figure 430 on page 186 in Basic Technical Drawing and in accordance with the instructor's checklist.
3. Construct auxiliary views of objectives that have the following conditions:
   a. object that has symmetrical planes.
   b. object that has asymmetrical planes.
   c. object that has curved surfaces.

   Your performance will be evaluated on the bases of figures 429 and 431 on pages 185-186 in Basic Technical Drawing and in accordance with the instructor's checklist.

LEARNING ACTIVITY:

In order to complete this unit successfully you should begin your work on Task Package 1, and then as a suggestion proceed to complete each task package in order until you have finished each package in this unit. In the packages you will be asked to view a sound-slide presentation, read and answer questions, and perform some practical exercises. The number and names of the task packages

LEARNING ACTIVITY (cont'd):

included in this unit are as follows.

TASK PACKAGE 1. CONSTRUCTION OF PRIMARY AUXILIARY VIEWS

TASK PACKAGE 2: CONSTRUCTING PARTIAL AUXILIARY VIEW

TASK PACKAGE 3: AUXILIARY VIEWS WITH SYMMETRICAL, ASYMMETRICAL AND CURVED SURFACES

If you should feel confident enough to pass a comprehensive test at this time, contact your instructor. However, should you feel you are not ready to be tested, begin your work as outlined above.

DC-VIII-1

UNIT VIII: AUXILIARY VIEWS

TASK PACKAGE 1: CONSTRUCTION OF PRIMARY AUXILIARY VIEWS

PREREQUISITES: UNITS I - VI

RATIONALE:

Good afternoon! Are you ready to rev up? Auxiliary views are views taken from a different direction, which supplement the regular views in showing more clearly the real shape of the object. Sometimes the presence of this special view on a drawing makes it unnecessary to draw one of the three principal views for a complete shape description of the object. Auxiliary is a term which means helping. An auxiliary view helps to show the true size and shape of objects. "Never put off till tomorrow what you can do in a task package today."

OBJECTIVE:

Upon completion of this task package you will be able to construct correctly a primary auxiliary view. Your performance will be evaluated on the basis of figures 421 - 424 on pages 181 - 183 in Basic Technical Drawing and in accordance with the instructor's check list.

LEARNING ACTIVITY:

1. Read pages 181-184 in Basic Technical Drawing.
2. The double feature for today is sound-slide presentation DC-VIII-1 and filmstrip FS 691793.
3. Study figures 420 and 421 on page 181 in your textbook.
4. What makes the regular views unclear as to how the object looks?

   _____

5. How do we obtain a true-size view of an inclined face?_____

   _____

6. Name the three ordinary auxiliary views._____

   _____

7. Study figures 422-424 on pages 182-183.
8. Note the steps in drawing a front auxiliary view.
9. The reference line is drawn at how many degrees from the object line in figure 424-4?_____
10. You have overcome this Learning Activity. Take your answers to the instructor.

LEARNING PRACTICE:

DIRECTIONS: Read the entire Learning Practice before starting to work.

1. Obtain a sheet of paper from your instructor.
2. Draw the bearing.
   a. Prepare your paper using layout "C".
   b. Study the bearing, figure 440, on page 192 in your textbook.

LEARNING PRACTICE (cont'd):

c. Draw the top and an auxiliary view of the bearing. Remember to space and center your views on the page neatly.

3. Draw the dovetail clip.

a. Turn to page 4 in this task package.

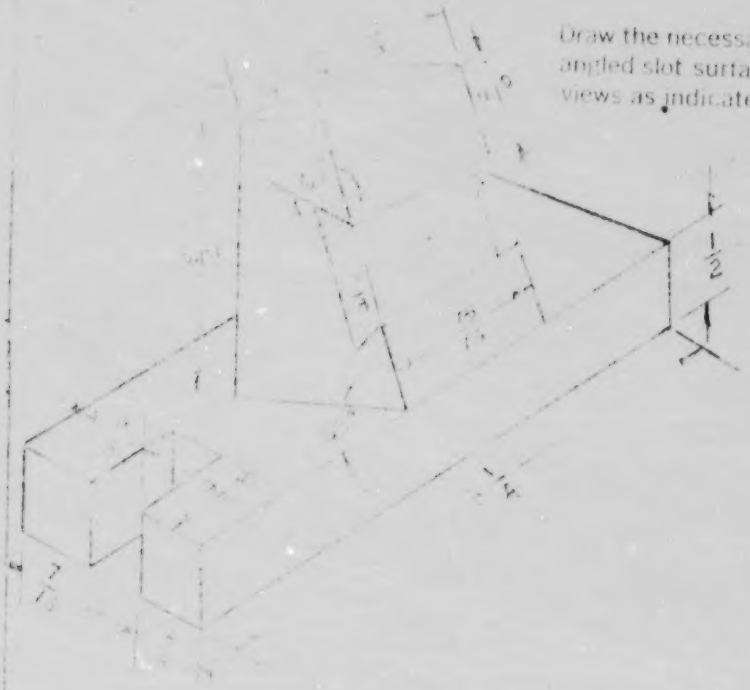
b. Follow the directions at the top of page 4

c. Use the center lines that are already drawn.

d. Do not dimension.

4. Good show!!! Take your drawings to the instructor for evaluation.

Draw the necessary views (full size) to show the true shape of the angled slot surface of the dovetail clip. Place the top and front views as indicated.



DATE	AUXILIARY VIEWS	DRAWING

DC-VIII-2

UNIT VIII: AUXILIARY VIEWS

TASK PACKAGE 2: CONSTRUCTING PARTIAL AUXILIARY VIEWS

PREREQUISITES: UNITS I - VI; UNIT VIII, TASK PACKAGE I

RATIONALE:

Good morning! This is station DC-VIII-2 signing on the air! It had been reported that a draftsman encountered a situation where he couldn't complete the view of an orthographic projection. To remedy this situation he had to construct a partial auxiliary view in order to find the true length of the lines he needed to further complete the views of the orthographic projection.

Now you can begin to see how one area of drafting links closely with another as we progress deeper into the field. You are creating building blocks of learning that will enable you to reach your final goal. After having been in drafting for a while, you'll find you have become "partial" to it.

OBJECTIVE:

Upon completion of this task package you will be able to construct a partial auxiliary view correctly. Your performance will be evaluated on the basis of figure 430 on page 186 in Basic Technical Drafting and in accordance with the instructor's check list.

LEARNING ACTIVITY:

1. Read pages 184-187 in Basic Technical Drawing.
2. Study figure 430 on page 186 in your textbook.
3. Why is it called a partial view?_____

_____

4. Study figure 431 on page 186 in your textbook.
5. How are hidden lines handled in auxiliary views?_____

_____

6. You're breezing along!! Take your answers to the instructor.

LEARNING PRACTICE:

DIRECTIONS: Read the entire Learning Practice before starting to work.

1. Obtain two sheets of paper from your instructor.
2. Draw the flanged 45° elbow.
   a. Prepare your paper using layout "C."
   b. Study the flanged 45° elbow, figure 438-2, on page 190 in your textbook.
   c. Draw a front view of the flanged 45° elbow as shown in figure 438-2 on page 190 in your textbook.
   d. Draw a partial auxiliary view of the elbow.
   e. Draw a partial view of the left side of the elbow.
   f. Dimension the views using correct procedure.

LEARNING PRACTICE (cont'd):

3. Draw the angle bearing.

   a. Prepare your paper using layout "C".

   b. Study the angle bearing, figure 438-4, on page 190 in your textbook.

   c. Draw a front and side view of the angle bearing.

   d. Draw a partial auxiliary view of the angle bearing.

   e. Dimension the views using the correct procedure.

4. "Time as he grows older teaches many task packages", and you've spent your time well on this one. Take your drawings to the instructor for evaluation.

DC-VIII-3

UNIT VIII: AUXILIARY VIEWS

TASK PACKAGE #3: AUXILIARY VIEWS WITH SYMETRICAL, ASYMETRICAL AND CURVED SURFACES

PREREQUISITES: UNITS I - VI: UNIT VIII, TASK PACKAGES 1 - 2

RATIONALE:

Are you ready to deal with some interesting shapes? Well, shapes are the concern of this task package. Hope you like these shapes.

Auxiliary views with curved, symmetrical and asymmetrical surfaces are encountered by the draftsman. He needs to know the techniques of projecting these different shapes found in auxiliary views. These techniques also help in the construction of the principal orthographic view. You should be able to accomplish a drawing task with confidence. This last task package in this unit completes a series of skills you have obtained. Congratulations on your accomplishments. "Remember today's knowledge is yesterday's task package."

DC-VIII-3

OBJECTIVE:

Upon completion of this task package you will be able to construct auxiliary views of objects that have the following conditions:

a. an object that has symmetrical planes.

b. an object that has asymmetrical planes.

c. an object that has curved surfaces.

Your performance will be evaluated on the basis of figures 429 - 431 on pages 185 - 186 in Basic Technical Drawing and in accordance with the instructor's check list.

LEARNING ACTIVITY:

1. Review Chapter 12 in Basic Technical Drawing.
2. Study figures 428 and 429 on page 185 in your textbook.
3. Note how a partial auxiliary view and one of the regular views are used to project one of the principal views.
4. Study figure 427 on page 184 in your textbook.
5. Proceed at your own pace. Abe Lincoln did. Check with your instructor before starting the Learning Practice. Ask him for six sheets of drawing paper.

DC-VIII-3

LEARNING PRACTICE:

DIRECTIONS: Read through the entire Learning Practice before starting to work.

1. Draw a symmetrical object.
   A. Prepare your paper using layout "C".
   B. Study figure 436, problem #22, on page 188 in your textbook.
   C. Draw the front and right side view of problem #22.
   D. Draw a partial auxiliary of the inclined surface.
   E. Do not dimension.
2. Draw a second symmetrical object.
   A. Prepare your paper using layout "C".
   B. Study figure 436, problem #23, page 188 in your textbook.
   C. Draw the front and right side view of problem #23.
   D. Draw a partial auxiliary of the inclined surface.
   E. Dimension the views using the correct procedures.
3. Draw an asymmetrical object.
   A. Prepare your paper using layout "C".
   B. Study figure 436, problem #17, on page 188 in your textbook.
   C. Draw the front and right side of problem #17.
   D. Draw a partial auxiliary of the inclined surface.
   E. Do not dimension.

LEARNING PRACTICE (cont'd):

4. Draw a second asymmetrical object.

   A. Prepare your paper using layout "C".

   B. Study figure 436, problem #24, on page 188 in your textbook.

   C. Draw a front and right side view of problem #24.

   D. Draw a partial auxiliary view of the inclined surface.

   E. Dimension using correct techniques.

5. Draw an object with curved surfaces.

   A. Prepare your paper using layout "C".

   B. Study figure 436, problem #27, on page 188 in your textbook.

   C. Draw a front and right side view of problem #27.

   D. Draw a partial auxiliary view of the curved surface.

   E. Do not dimension.

6. Draw a second object with curved surfaces.

   A. Prepare your paper using layout "C".

   B. Study figure 436, problem #29, on page 188 in your textbook.

   C. Draw the front and right side views of problem #29.

   D. Draw a partial auxiliary view of the curved surface.

   E. Dimension using correct techniques.

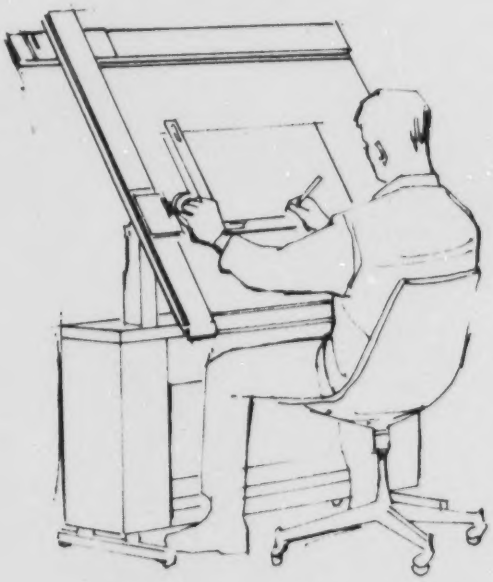
7. Smile and the whole world smiles with you! You've finished another Learning Practice. Take your drawings to the instructor for evaluation.

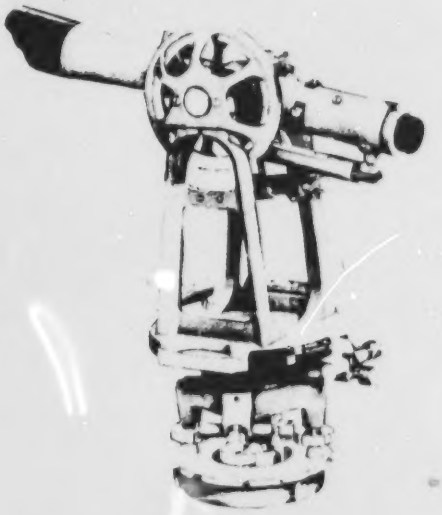
RESEARCH PROJECT

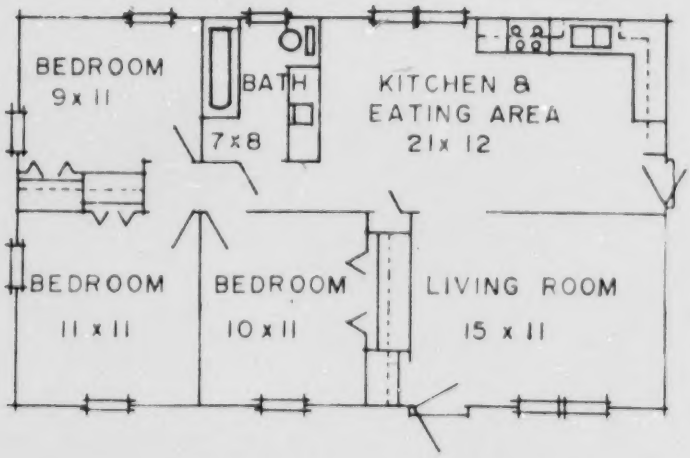
SANFORD CENTRAL HIGH SCHOOL

1708 NASH STREET

SANFORD, NORTH CAROLINA 27330







CLUSTER: DRAFTING

COURSE: INTRODUCTION TO TECHNICAL DRAFTING

CE003935 (2)

DC-IX

UNIT PACKAGE IX: ARCHITECTURAL DRAFTING

PREREQUISITES: UNITS I-VII

RATIONALE:

The draftsman may find that at some time during his career he will be called upon to draw a floor plan and elevations. To perform a function such as this he needs to be knowledgeable in the use of the symbols and the terminology of producing such architectural drawings. The skills you can develop from the completion of this unit will help you develop the floor plan and elevations that an architectural draftsman has to draw. The correct use and implementation of the symbols and procedure for drawing must be adhered to, because you don't want to misrepresent your ideas.

OBJECTIVES:

General:

Upon completion of this unit package you will be able to identify and draw the basic symbols used in architectural drawing and develop and draw a floor plan with the required elevations.

OBJECTIVES (cont'd):

Specific:

Upon completion of the task packages for this unit, you will be able to:

1. Correctly name in writing, from illustrations, all the architectural symbols shown in this package and in accordance with the instructor's checklist.
2. Given a set of specifications, do the following:
   a. Select the proper room size for a floor plan from a chart.
   b. Draw a preliminary sketch and final floor plan.
   c. Properly dimension architectural drawings.

   Your performance will be evaluated in accordance with the instructor's checklist.
3. Identify, by listing in writing from illustrations, the different styles and types of common roofs found in architectural drafting. Your performance will be evaluated in accordance with the instructor's checklist.
4. Draw correctly four elevations from the floor plan in Unit IX-2. Your performance will be evaluated in accordance with your instructor's checklist.

LEARNING ACTIVITY:

In order to complete this unit successfully you should begin your work on Task Package 1, and then as a suggestion proceed to complete each task package in order until you have finished each package in this unit. In the packages you will be asked to view a sound-slide presentation, read and answer questions, and perform some practical exercises. The number and names of the task packages included in this unit are as follows.

TASK PACKAGE 1: IDENTIFICATION OF ARCHITECTURAL SYMBOLS

TASK PACKAGE 2: FLOOR PLANS AND ROOM SIZES

TASK PACKAGE 3: DRAWING ELEVATIONS AND IDENTIFYING TYPES OF ROOFS

If you should feel confident enough to pass a comprehensive test at this time, contact your instructor. However, should you feel you are not ready to be tested, begin your work as outlined above.

DC-IX-1

UNIT IX: ARCHITECTURAL DRAFTING

TASK PACKAGE 1: IDENTIFICATION OF ARCHITECTURAL SYMBOLS

PREREQUISITES: UNITS I-VIII

RATIONALE:

Do you know that the architectural draftsman has his own lingo that is a graphic language? He uses symbols to represent objects on his drawings. If he were to draw the objects as they actually are, or were to use notes on his paper; the workman would be so confused he could not understand the draftsman's ideas. The draftsman has to know the meaning of these symbols of his graphic language and how to apply them in his daily tasks. The symbols serve as a type of shorthand for the architectural draftsman. Your success with this task package can be a "symbol" of your achievement.

OBJECTIVE:

Upon completion of this task package you will be able to correctly name in writing, from illustrations, all the architectural symbols shown in this package. Your performance will be evaluated on the basis of listing all symbols given and in accordance with the instructor's checklist.

DC-IX-1

LEARNING ACTIVITY:

1. Read pages 334 through 338 in Mechanical Drawing, by French and Svenson.
2. Read pages 169 through 172 in Architecture Drafting and Design by Hepler and Wallach.
3. Study figure 21-26d on page 336 in Mechanical Drawing.
4. What three types of wood section symbols are found in this figure?_____
5. What three types of brick section symbols are found in this figure?_____
6. Study page 6 in this task package and figure 21-27 on page 337 in Mechanical Drawing.
7. Look at the section entitled Convenience Outlets. Do you know what these symbols represent? They represent wall plug-ins.
8. Look at the section entitled Switch Outlets. These symbols represent the different switches that turn lights on and off.
9. How many switch outlet symbols are shown on page 6 of this package? Name them:_____
10. Look at page 6 in this task package and figure 21-28 on page 338 in Mechanical Drawing. These are symbols for plumbing fixtures.
11. The symbols seen in this Learning Activity represent those most commonly used in architectural drafting.
12. You have overcome this Learning Activity. Take your answers to the instructor.

LEARNING PRACTICE:

DIRECTIONS: Read the entire Learning Practice before starting to work.

1. Obtain a sheet of paper. Use layout "C" and draw the following symbols: (You may use your house plan template where applicable.)

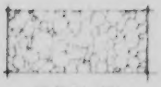
   a. outside door
   b. swinging door
   c. double window
   d. earth
   e. cinders
   f. double outlet
   g. range outlet
   h. fluorescent light
   i. double-pole switch
   j. ceiling outlet

ARCHITECTURAL SYMBOLS USED IN DRAFTING

ELEVATION

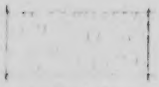
SECTION

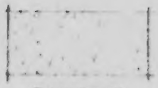
CONCRETE



GRAVEL

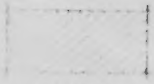
SAND



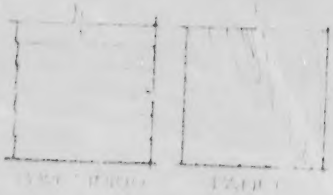


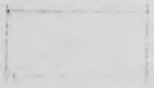
CINDER

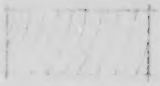
BRICK

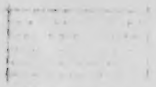


WOOD









GLASS

GENERAL OUTLETS

CEILING OUTLET

WALL OUTLET

CONVENIENCE OUTLETS

DUPLEX OUTLET

WP WATERPROOF OUTLET

R RANGE OUTLET

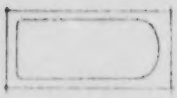
SWITCH OUTLETS

S SINGLE POLE SWITCH

S_2 DOUBLE POLE SWITCH

S_3 THREE WAY SWITCH

S_4 FOUR WAY SWITCH



TUB

SHOWER

WATER CLOSET

KITCHEN SINK

LAVATORY

WM WASHING MACHINE

UNIT IX: ARCHITECTURAL DRAFTING

TASK PACKAGE 2: FLOOR PLANS AND ROOM SIZES

PREREQUISITES: UNITS I - VIII; UNIT IX, TASK PACKAGE 1

RATIONALE:

Are you a man with a plan? Here's a task package with a plan - floor plan, that is.

One of the first steps in architectural drafting is drawing a rough idea of the floor plan. The draftsman indicates the types and sizes of the rooms the plan will have and also uses the correct architectural symbols. The floor plan that you design will be small, but never-the-less, you will be expected to produce a quality product. You probably realize that great things start in a small way. This is your opportunity to be creative. "A creative individual is a happy man."

OBJECTIVE:

Upon completion of this task package you will be able, given a set of specifications, to do the following:

a. select the proper room size for a floor plan from a chart.

b. draw a preliminary sketch and a final floor plan.

c. properly dimension architectural drawings.

Your performance will be evaluated in accordance with the instructor's checklist.

DC-IX-2

LEARNING ACTIVITY:

1. Read pages 154 through 184 in Architecture Drafting and Design.
2. Review the sound-slide presentation DC-IX-2 for today's matinee.
3. Study page 7 in this task package showing the typical sizes of rooms.
4. What is the typical size of a medium-size bathroom? _____
5. What is the typical size of a large-size bedroom? _____
6. What is the typical size of a small-size kitchen? _____
7. What is the purpose of the preliminary sketches? _____

_____

8. Study the rules for dimensioning on page 180 in Architecture Drafting and Design and on pages 5 and 6 of this task package.
9. What scale is most commonly used for house plan drawings?

_____

10. In dimensioning the house plan drawing, do you use feet and inches? _____
11. Where are the partitions or interior walls dimensioned from?

_____

12. Keep growing!!! Take your answers to the instructor.

LEARNING PRACTICE:

DIRECTIONS: Read the entire Learning Practice before starting to work.

LEARNING PRACTICE (cont'd):

1. Obtain a sheet of drawing paper from your instructor.
2. From the information supplied by the following statement and the other task packages, you will draw a preliminary floor plan sketch, using the appropriate symbols and the correct techniques.

STATEMENT OF THE PROBLEM: Mr. Frank Money-bags wants you to design and draw a small frame vacation cottage for him. He wants the following rooms:

a. a small bedroom
b. a medium bedroom
c. a large bathroom
d. a medium kitchen
e. a large living area
f. a large dining area
g. all closets 2' - 0" x 3' - 0"

The preliminary floor plan sketch should contain the room sizes. You can use your own imagination about window and door placement. Each bedroom should have a closet with one other general closet somewhere in the house. Mr. Money-bags wants you to express yourself in the total design of the floor plan.

LEARNING PRACTICE (cont'd):

3. Draw the preliminary floor plan sketch.
   a. Prepare your sheet using layout "C".
   b. Draw the preliminary floor plan sketch using the correct symbols and technique.
   c. Dimension the floor plan using correct technique.
   d. You may need to confer with the instructor at various times during this Learning Practice. Please feel free to seek assistance when necessary.
   e. When you finish your preliminary floor plan sketch take it to your instructor for an evaluation. When he is through with his evaluation he will give you a sheet of drawing paper and instructions for using the proper layout on your final plan. (Use layout "E" modified.)
4. Draw the final floor plan.
   a. Prepare your sheet using the proper layout.
   b. Draw the final floor plan as approved by your instructor. You will use 1/4" = 1' - 0" as the scale. Be sure to use the correct techniques.
   c. Dimension the final floor plan using correct techniques.
5. When you have completed this Learning Activity give the drawing to your instructor. You and he will evaluate your work.

* You know, son, you could very well be on your way to being another Frank Lloyd Wright. He started the same way.

PLAN VIEW ARCHITECTURAL DIMENSIONING RULES

1. Extension lines preferably should not touch the plan. On occasion it may be permissible to touch the plan with the extension line.

2. Dimension lines should be spaced a minimum of 3/8" from the plan and 3/8" apart.

3. Dimension lines are continuous lines with the numerals placed above the line.

4. Arrowheads are standard open or closed type, made in the proportion 3 long to 1 wide. For close or tight places, dots at the end of the line may be used.

5. Dimension figures are placed to read from the bottom and right hand side of the drawing.

6. Dimension figures and notes should be 1/8" high.

7. Feet and inch marks are shown on the dimensions. Clearness of interpretation is the guiding rule. Dimensions are usually written thus: 21' - 5"; 3' - 0 1/2"; 0' - 7"; 6"; 5 1/2"; $11^{3} \times 12^{9}$.

8. Avoid unnecessary crossing of dimension lines by placing window and door (shorter) dimension nearest the plan, with the overall (longest) dimension farthest from the plan.

9. Make all letters and numerals legible. Fancy twists cause difficult reading.

10. Avoid crowding by allowing sufficient room for dimensions.

11. All useable dimensions are shown. Do not assume symmetry of centering.

12. Overall dimensions must be shown. Detail dimensions totaling the overall must be shown.

13. Interior doors at the corner of a room need not be dimensioned.

14. Identical width of end to end rooms or closets do not require repeat dimensions.

15. Doors located away from the corner of the room, and windows, must be located.

16. Do not leave any addition or subtraction of dimensions to the builder.

17. Beams and support columns are located by dimensioning to their centerline.

Plan View Architectural Dimensioning Rules (cont'd):

18. Window and door sizes are given in the window and door schedules. The opening is referenced on the elevation view.

19. House drawings are most commonly made to the scale 1/4" = 1' - 0". Large buildings are often drawn to the scale 1/8" = 1' - 0". Details are drawn to a larger scale. Always indicate the scale in the title block or near the view.

20. Sectional views, drawn to enlarged scale, show the construction and provide a place to specify the material and sizes.

TYPICAL ROOM SIZES

ROOM	SIZE	AREA IN SQ. FT.	SIZE EXAMPLE
Entrance Area	Small Medium Large	25 - 30 35 - 40 45 - up	5' x 6' 5' x 8' 5' x 9'
Living Room	Small Medium Large	150 - 200 220 - 280 300 - up	12' x 15' 13' x 20' 14' x 22'
Family Room or Dining Space	Small Medium Large	100 - 130 150 - 180 200 - up	10' x 12' 12' x 15' 13' x 16'
Dining Alcove	Small Medium Large	25 - 40 50 - 70 80 - up	5' x 8' 7' x 9' 8' x 10'
Kitchen	Small Medium Large	50 - 90 100 - 140 160 - up	7' x 10' 10' x 14' 10' x 16'
Bedroom	Small Medium Large	80 - 130 140 - 190 200 - up	10' x 12' 12' x 14' 13' x 16'
Bathroom	Small Medium Large	33 - 35 40 - 45 50 - up	5' x 7' 6' x 7' 6' x 9'
Heater Room	Small Medium Large	12 - 15 18 - 25 30 - up	3' x 5' 5' x 5' 5' x 6'
Closets	Minimum Average Over 36"	24" minimum inside depth 30" - 32" inside depth Poor use of space	
Utility Room	4' x 6' without water heater 4' x 8' with water heater (overhead shelf) 5' x 10' minimum with water heater & laundry tubs		
Garages and Carports	1 car - 10' x 20' minimum (no storage space) 2 cars - 18' x 20' minimum (no storage space)		

UNIT IX: ARCHITECTURAL DRAFTING

TASK PACKAGE #3: DRAWING ELEVATIONS AND IDENTIFYING TYPES OF ROOFS

PREREQUISITES: UNITS I-VIII; UNIT IX, TASK PACKAGES #1 & #2

RATIONALE:

This is the city. It contains houses - and it needs more and better houses. These houses will have to be designed by you. You've already drawn the floor plan, so it's time to raise your design to a higher level.

You did a final floor plan in the last package. Now, we're going to bring that house to life. By using the floor plan and some simple means of projection, you'll be able to create the elevation of the floor plan. This is more or less a picture of each side of the house you've designed. It gives the workman a pictorial view of what the residence looks like as compared to the floor plan. The elevations are a vital part to any plans that you do for a house. The new owner can get a good picture of what his dream house will look like. But it's important that you draw the elevation carefully because if you don't, then you'll misrepresent your idea expressed on the floor plan.

Become "elevated" to another task package.

DC-IX-3

OBJECTIVE:

Upon completion of this task package you will be able to do the following:

a. identify in writing, five roof types from illustrations.

b. draw four elevations of a residence.

Your performance will be evaluated in accordance with the instructor's checklist.

LEARNING ACTIVITY:

"The facts you are about to receive are true; nothing has been changed to protect. . . anyone."

1. Read pages 185 through 218 and 372 through 374 in Architectural Drawing.
2. The feature attraction today is sound-slide presentation DC-IX-3.
3. How many elevation drawings are there?
4. Select the figures pertaining to the types of windows on pages 209-214 in your reading material.
5. Study the types of entrance doors in the figure on pages 210, 211, and 214 in your reading material.
6. What is the height range of exterior doors?

LEARNING ACTIVITY (cont'd):

7. Name the four common types of roofs seen in your reading material.

_____

8. What does the word pitch mean when related to roof design?

_____

9. Why do we use a door and window schedule? _____

_____

10. What is the recommended window height? _____

11. Study page 373 in your reading material.

12. What is the size of the bedroom doors? _____

_____

13. What is the size of the entry door? _____

_____

14. What is the size of the bathroom doors? _____

_____

15. Congratulations! You've finished the Learning Activity. Take your answers to the instructor.

LEARNING PRACTICE:

DIRECTIONS: Read the entire learning practice before starting to work.

1. Identify the types of roofs illustrated on page 6 in this task package. List your answer in the corresponding blanks below:

a. Figure 1 _____

LEARNING PRACTICE (cont'd):

b. figure 2 _____

c. figure 3 _____

d. figure 4 _____

e. figure 5 _____

f. figure 6 is used to show you the parts of a roof.

2. Draw a front elevation of a floor plan.

a. Obtain four sheets of paper from your instructor as you need it.

b. Prepare your paper using layout "E" modified.

c. Using the finalized floor plan from the last task package, draw a front elevation of the house.

1) use 1/4" = 1' - 0" scale.

2) use your own design for outside features and roof type.

d. Dimension the front elevation using correct techniques.

3. Draw a right side elevation of a floor plan.

a. Prepare your paper using layout "E" modified.

* Space your views so that you can get both the right and left elevation on the same page, if possible.

b. Draw the right side elevation.

c. Dimension the right side elevation using correct techniques.

LEARNING PRACTICE (cont'd):

4. Draw the left side elevation of a floor plan.
   a. Prepare your paper using layout "E" modified.
   b. Draw the left side elevation.
   c. If you feel the need to talk to your instructor, do so.
5. Draw the rear elevation of a floor plan.
   a. Prepare your paper using layout "E" modified.
   b. Draw the rear elevation.
   c. Dimension the rear elevation using correct techniques.
6. So you've completed another task package! Take your work to the instructor for evaluation.

"You keep this up and Lucy will love you forever."

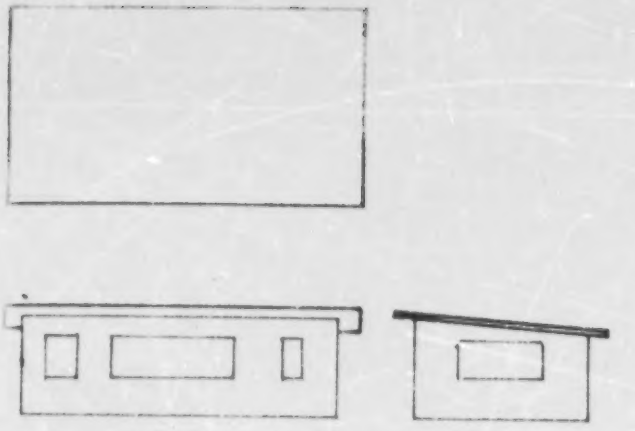


Figure 1

Figure 4

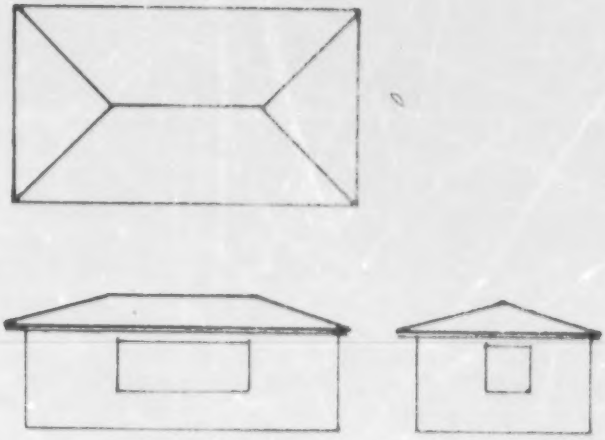


Figure 2

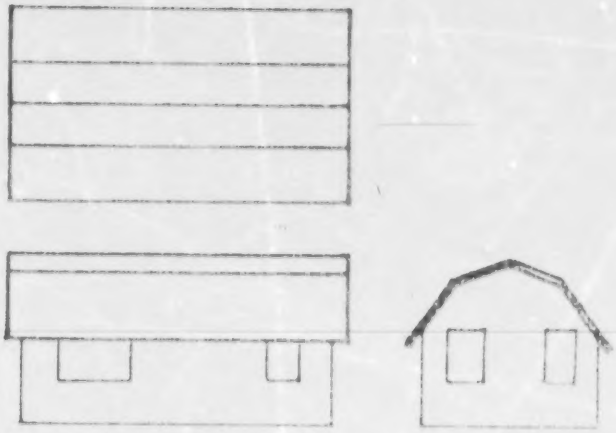


Figure 5

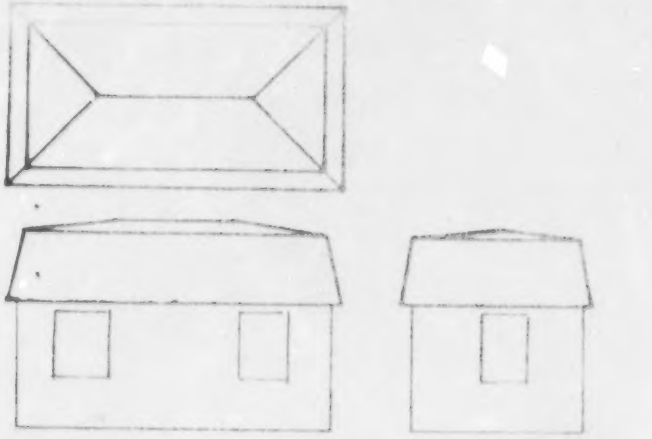
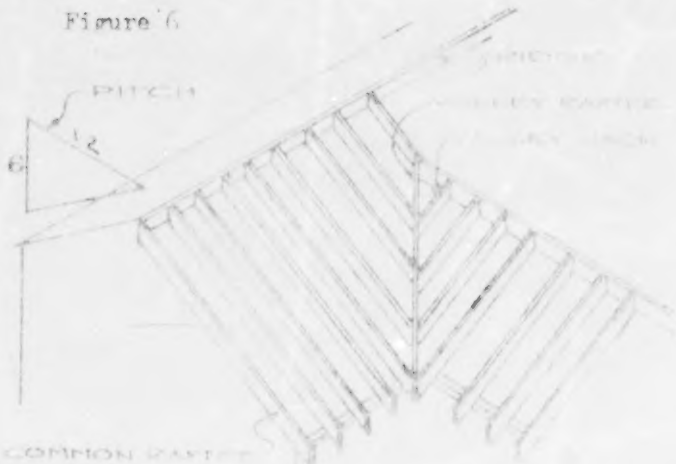


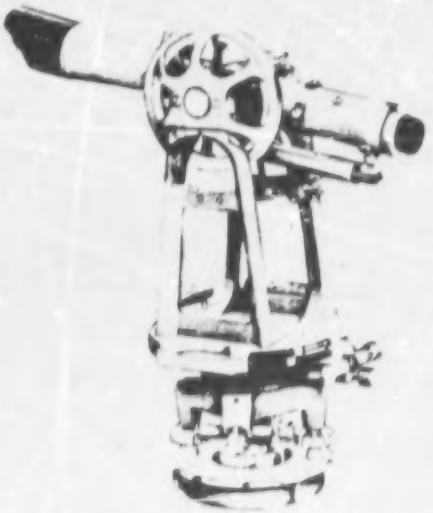
Figure 3

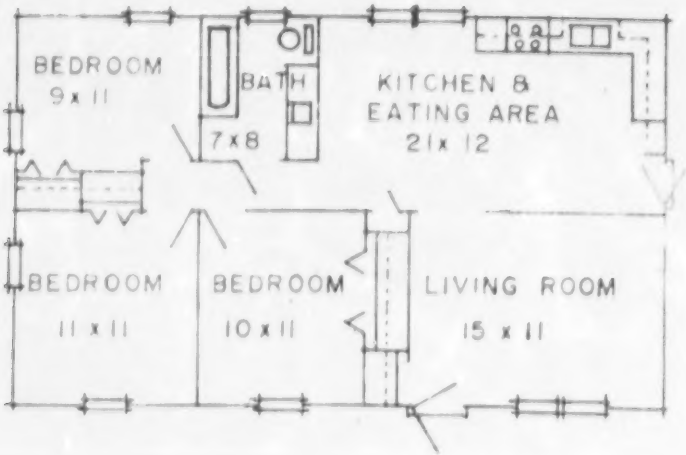
Figure 6



BASIC ROOF STYLES

RESEARCH PROJECT
SANFORD CENTRAL HIGH SCHOOL
1708 NASH STREET
SANFORD, NORTH CAROLINA 27330





CE003935 (4)

CLUSTER: DRAFTING

COURSE: INTRODUCTION TO TECHNICAL DRAFTING

DC-X

UNIT PACKAGE X: MAP DRAFTING

PREREQUISITES: UNITS I-IV

RATIONALE:

We are constantly reminded of the fact that we need a map as we travel across a distant state or when we twirl the globe and watch it spin. They don't find these maps in crackerjack boxes. Where do they come from? Draftsmen use their skills to produce excellent maps.

There are various types of maps used in the world today. This unit will cover only three: the plot, the topographic and the contour map. The draftsman needs to be familiar with the different types of maps mentioned and be able to construct one from given information. "Map yourself some success by completing this unit."

OBJECTIVES:

General:

Upon completion of this unit package you will be able to draw a plot for a subdivision, a contour map and a topographical map using the accepted representation.

Specific:

Upon completion of the task packages for this unit, you will be able to:

1. Accurately draw a plot of a subdivision using the accepted representation. Your performance will be evaluated in

OBJECTIVES (cont'd):

accordance with the instructor's checklist.

2. Accurately draw a contour map using the accepted representation and in accordance with the instructor's checklist.
3. Accurately draw a topographic map using the accepted representation and in accordance with the instructor's checklist.

LEARNING ACTIVITY:

In order to complete this unit successfully you should begin your work on Task Package 1, and then as a suggestion proceed to complete each task package in order until you have finished each package in this unit. In the packages you will be asked to view a video-tape presentation, read and answer questions, and perform some practical exercises. The number and names of the task packages included in this unit are as follows.

TASK PACKAGE 1: DRAWING A PLOT OF A SUBDIVISION

TASK PACKAGE 2: DRAWING A CONTOUR MAP

TASK PACKAGE 3: DRAWING A TOPOGRAPHICAL MAP

If you should feel confident enough to pass a comprehensive test at this time, contact your instructor. However, should you feel you are not ready to be tested, begin your work as outlined above.

DC-X-1

UNIT X: MAP DRAFTING

TASK PACKAGE #1: DRAWING A PLOT OF A SUBDIVISION

PREREQUISITES: UNITS I-IV; VI

RATIONALE:

Map making is an industry that employs draftsmen. There are many types of maps. This package is concerned with one of the more common types. The map of a plat (or plot as it is sometimes called), is used by surveyors, architects, industry and towns everywhere.

This type of drafting is very important in the selling and buying of land. It lets the buyer know what he is getting and the seller know what he is selling.

This is another skill you can master if you'll only "plot" onwards.

OBJECTIVE:

Upon completion of this task package you will be able to accurately draw a plot of a subdivision using the accepted representations. Your performance will be evaluated in accordance with the instructor's check list.

DC-X-1

LEARNING ACTIVITY:

1. Read chapter 21, page 335 in Basic Technical Drawing.
2. Read pages 368-370 in Mechanical Drawing, by French and Svensen.
3. Read pages 90-105 in Surveying: Theory and Practice, by Davis, Foote and Kelly.
4. What type of map is a plot or plat?

5. How are the lines of a plot established?

6. What is the purpose of a city plot?

7. Define the term "bearing" as applied to map drafting.

8. What scale is used in map drafting?

9. Study figure 673 on page 136 in Basic Technical Drawing.
10. What is the total acreage of the three tracts, excluding the road?
11. Study paragraph 6-3 on page 90 in Surveying: Theory and Practice.
12. Paragraph 6-3 lists all the information a plot should contain.
13. Does figure 673 in Basic Technical Drawing contain all the information listed in paragraph 6-3? Why?

LEARNING ACTIVITY (cont'd):

14. What is the scale used for the plot in figure 673 on page 336 in Basic Technical Drawing? _____

15. Looks as if you're "plotting" along. Take your answers to the instructor.

LEARNING PRACTICE:

DIRECTIONS: Read the entire Learning Practice before starting to work.

1. Study page 5 in this task package.

2. This sheet shows a partially completed drawing of a traverse survey. From station A, station B and D were located.

   a. Scale the bearing and distance of B D.

   b. Scale the distance of B C.

   c. Scale the distance of D C.

   d. Place your answers in the appropriate places on the drawing.

3. Draw a plot plan for a subdivision.

   a. Obtain a sheet of paper and civil engineer's scale from your instructor.

   b. Study figure 673 on page 336 in Basic Technical Drawing.

   c. Using a scale of 1" = 200', draw the Alexander Tract.

   d. Construct a street with a 60' right of way around the inside perimeter from Bruce Highway No. 55.

LEARNING PRACTICE (cont'd):

e. Subdivide the north portion of the tract into 66 lots, each approximately 200' wide x 180' deep. This will allow for two streets with 60' right of way running east-west.

f. Subdivide the portion of the tract south of the highway into 10 lots, each approximately 167' wide x 235' deep.

g. Use a title block similar to that shown in figure 673.

h. Use figure 674 on page 337 in Basic Technical Drawing as a guide. Should you have any questions, see your instructor.

4. It's your map, Charlie Brown! You've finished another Learning Practice. Take your drawings to the instructor for evaluation.

UNIT X: MAP DRAFTING

TASK PACKAGE 2: DRAWING A CONTOUR MAP

PREREQUISITES: UNITS I-VI; UNIT X, TASK PACKAGE 1

RATIONALE:

Up on the mountain or down in the valley - you can't get away from contours regardless of where you are. And you'll discover in this task package the value of contours on a special kind of map. So happy contouring.

We studied plot maps in package 1. In this package we will encounter contours. This is the type of map that shows the elevation of the ground. A contour map shows the hills and valleys of the area mapped. The contour map and the profile connected with these maps are very important for the construction of roads, canals and other structures. The civil engineer relies on such maps to be accurate, concise and up to date. "Shape your map-drafting ability

OBJECTIVES:

DC-X-7

LEARNING ACTIVITY:

1. Read pages 335-338 in Basic Technical Drawing.
2. Read pages 371-374 in Mechanical Drawing.
3. What is a contour line? _____

_____

4. What does profile in reference to contour lines? _____

_____

5. What must be done before a contour map is drawn? _____

_____

6. Study Figure 7-5 on page 371 in Mechanical Drawing.
7. What is the highest elevation on the contour map in Figure 23-7a?
8. Study Figure 8-3 on page 337 in Basic Technical Drawing.
9. What is the lowest elevation point on the contour map in _____

_____

10. Study Figure 7-6 on page 372 in Mechanical Drawing.
11. Name the method used to project views for the map in Figure 7-6 _____

_____

12. What would be the difference in the drawings if the view were _____

_____

_____

13. You have a paper to turn in on this activity. Check with your _____

instructor.

DC-X-2

LEARNING PRACTICE:

DIRECTIONS: Read the entire Learning Practice before starting to work.

1. Draw a contour map.
   a. Obtain a sheet of paper from your instructor. (Items 1 and 2 will both be drawn on this sheet of paper.)
   b. Study problem 23.11 on page 551 in Mechanical Drawing.
   c. Prepare your paper using layout "E".
   d. Following the instructions listed in problem 23.11, draw the contour map shown.
   e. If you have any questions please see your instructor.
2. Draw a profile from a contour map.
   a. Using the contour map drawn in part one of this Learning Practice, draw one profile taken on a horizontal grid as designated by your instructor.
   b. Working space 10" x 12".
   c. Vertical profile scale 1" = 100'.
3. Now that you've completed this Learning Practice, take it to the instructor for evaluation.

Like the car rental agency, always try harder.

UNIT 5: MAP SKILLS

TASK 3: [illegible] A TOPOGRAPHIC MAP

PREREQUISITE: [illegible]

Activities

[illegible] you [illegible] or where you've been. [illegible] represent [illegible] that is [illegible] in this unit. "Finding [illegible] successful."

DC-X-3

LEARNING ACTIVITY (cont'd):

1. Read pages 335-339 in Basic Technical Drawing.
2. Read pages 376-380 in Mechanical Drawing.
3. Read pages 97-105 in Surveying: Theory and Practice.
4. Read pages 250-261 in Architecture Drafting and Design.
5. What are three things found on a topographical map?

6. What does the term "Contour Lining" mean in reference to topographical maps?
7. What are culture symbols on a topographical map?

8. Study pages 98-100 in Surveying: Theory and Practice.

LEARNING PRACTICE:

1. Draw a topographic map.
   a. Obtain a sheet of paper from your instructor.
   b. Required working space 9" x 12".
   c. Study figure 6-1 on page 117 in Basic Technical Drawing.
   d. Draw figure 6-2 using a scale 1" = 200'.
   e. If you have any problems, check with your instructor.

This is the last task package in the Drafting Core Series. Congratulations on your accomplishment. Success is a wonderful feeling, especially when you have worked so hard to accomplish it. We hope you have succeeded and that you will seriously think of taking the other series in areas of drafting. Have creative [illegible] world needs them.